CHEMICAL CORPS JOURNAL

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Chemical Warfare Association

Primary Mission:

The members of this Association, mindful of the vital importance of chemical warfare in the field of national defense, have joined together as a patriotic obligation to preserve the knowledge derived from their war experiences and to encourage improvements in science as applied to the Chemical Warfare Service. The objects of this Association, therefore, are to sponsor new developments designed to increase the efficiency of chemical warfare means, to collect and disseminate useful knowledge with respect to chemical warfare and related subjects, to foster a spirit of good will and cooperative endeavor among its members and with industry, and to perpetuate the friendships, memories and traditions growing out of their service with the Chemical Warfare Service. The members of this Association and its constituent local Chapters are mutually pledged to the furtherance and promotion of these objects.

Membership Eligibility:

Any person who is or may be assigned or detailed to duty with or in the Chemical Warfare Service, whether as officer, warrant officer, enlisted man or civilian employee, or who has been honorably discharged from such duty, and any person interested in the promotion of chemical warfare preparedness for national defense, may upon approval of the Executive Committee and payment of the annual dues hereinafter specified become a Regular member of this Association.

(If you are not now a member, fill in the following application and mail):

- - - -

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Lt. Col. HAROLD B. RODIER, *CmlC, Ret.*, Editor

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THE PICTURE ON THE COVER

GENERAL EISENHOWER
Principal Speaker at Chicago Dinner

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". . . to sponsor new developments designed to increase the efficiency of chemical warfare means, to collect and disseminate useful knowledge with respect to chemical warfare and related subjects, to foster a spirit of good will and cooperative endeavor among its members and with industry, and to perpetuate the friendships, memories and traditions growing out of their service with the Chemical Warfare Service . . ."

The Chemical Warfare Association

COL. LUDLOW KING, *President*
1031 Investment Building
Washington, D. C.

CAPT. JOSEPH SCHWIMER, *Cml. Res., Sec'y-Treasurer*
2153 Florida Avenue N.W.
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LT. COL. HAROLD B. RODIER, *CC, Ret., Editor*
2153 Florida Avenue N.W.
Washington 8, D. C.

Associate Editors:
COL. HARRY A. KUHN, *CC, Ret.* CAPT. JOHN F. CARROLL, *Cml. Res.*
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Vol. I **JANUARY, 1947** **No. 2**

WHY FORM A CHAPTER?

A stock question among the members of the CWA throughout the country has been, "Why form a chapter?" An appropriate answer would be the trite phrase, "In unity there is strength."

Associations such as the CWA are established for the benefit of its individual members and the lifeblood of such an organization is not the National Headquarters but the chapter groups. Local chapters should be formed to give the individual member the most benefit from his investment in the Association.

Chapter groups perform many functions in a large organization. First, a local group is necessary to accomplish one of the main objectives of the Association, i.e., "To perpetuate the friendships, memories and traditions growing out of association with the Chemical Corps. Local chapters can organize meetings and social affairs to create and maintain many personal friendships.

Second, the chapter is a necessary link in the administration of a large organization. It is impossible for the National Headquarters to correspond with each individual member regarding the many issues affecting the Association. Local chapter officers are able to contact their members more expeditiously and voice a joint opinion of the members in that vicinity.

Third, the local chapter provides a medium for the member to discuss the issues and objectives of the Association. Collective thinking is far more constructive than the thoughts of an individual. Groups with active programs may benefit the individual, industry, the Army and the nation itself.

Fourth, the National Headquarters has a function of conveying the Chemical Corps' actions and thoughts to its members. This may be accomplished through several mediums. The Association publications, *Chemical Corps Journal* and the *News*, are the best means, but all the information cannot possibly be published. Other means, such as War Department speakers, will have to be provided. In this manner large groups can receive the latest developments first hand. To provide these speakers, a local group organization is necessary.

Fifth, a chapter organization permits the individual to have a voice in the national meeting. A representative of each chapter is a delegate to the meetings and may express the views of the local members regarding the policies and programs of the national organization. It is obviously impossible to permit each individual member to voice his personal opinion at such meetings.

Sixth, one of the more important functions of the CWA is to foster a spirit of good will and cooperative endeavor among its members and with industry. This mission can only be accomplished by local chapters cooperating with its local industries.

The above points indicate that the CWA, to succeed in its purposes, needs more local chapters. Strong local chapters indicate a progressive Association. The CWA intends to be a strong leading organization so let's get out and organize the members in your area.

LUDLOW KING, *President,*
Chemical Warfare Association

SCIENTIFIC SOCIETY MEETINGS

A science-conscious Congress last session appropriated over a billion and a half dollars for government research and development. Congressmen, knowing that tremendous sums must be spent to keep this nation in the lead in scientific achievements, were only too willing to keep our colossal wartime technical program in operation by appropriating these millions for various projects. While these same Congressmen were handing out huge sums on one hand, they were busily hindering the administration of this program on the other by inserting paltry riders into appropriation bills for the government agencies.

For example, Public Law 515, an appropriation act for military establishments for the fiscal year 1947, contained the following clause:

"That, in addition to the authority contained

in section 67, National Defense Act of June 3, 1916, as amended, a total of not to exceed $15,000 of the appropriations available to the War Department chargeable with expenses of travel shall be available for expenses incident to attendance at meetings of technical, professional, scientific, and other similar organizations, when, in the judgment of the Secretary of War, such attendance would be of benefit in the conduct of the work of the War Department."

This shortsighted bit of legislation permits the entire War Department to expend only $15,000 for its approximately 40,000 scientific and technical personnel to attend meetings of scientific and technical organizations. Under these provisions only a few of the Army's scientific personnel are permitted to attend meetings of their societies. Others who desire to attend must travel and subsist at their own personal expense.

It is a foregone conclusion that attendance at scientific and technical society meetings is a necessary part of a scientist's education and profession. These meetings are not conventions or fiascos but are a medium for these persons to gather new knowledge in their specific fields. Here the latest discoveries and achievements of colleagues are presented first hand and the information is invaluable to scientists in further pursuing their work. Much of this information is often not available in printed form for many months or years. In addition, these meetings provide an opportunity for personal association and an exchange of information with fellow workers. Scientists, unlike most professions, depend upon a free exchange of information regarding their specific problems. One of the main purposes of such meetings is to provide an opportunity for such discussions and exchange of information.

On the whole, government scientific and technical personnel are underpaid. Consequently, it is impossible for these workers to expend several hundred dollars of their own funds to attend these meetings, even though they be essential to the accomplishment of their mission.

The government, at present, is seeking thousands of scientists to administer its gigantic research and development program. There is a dearth of highly trained technical administrators, due to the fact that these persons are turning to industry where salaries are higher; facilities are more modern and opportunities are provided for them to keep abreast of their profession.

Should qualified scientists refuse to accept government positions because of the lack of such a paltry monetary reimbursement, the entire program may fail. A billion dollar expenditure will then become a bust because of hampering restrictions.

It is obvious that the 80th Congress, now in session, will continue to appropriate millions to continue the present research program. While such legislation is being enacted, it is hoped that cognizance will be taken of the minor details that may impede the progress of these programs. Congressmen should include in their measures attractions to scientific personnel such as increased salaries, educational opportunities and the necessary funds to attend scientific meetings. The provisions of Public Law 515 relating to attendance at meetings should be repealed and sufficient funds provided for the necessary personnel to attend such meetings.—A. L.

THANK YOU VERY MUCH!

Your Editor expresses his warm appreciation of the assistance rendered in getting out this issue of *The Journal* by Al Leggin, Director of Public Relations, CWA, and Howard L. Shine, our new Associate Editor, during our sojourn in a hospital. For their timely and excellent pinch-hitting, our high praise and gratitude.

SABRE RATTLING?

Jack Munhall, Capt., Cml. Res., in a "Letter to the Editor," raises a point both pertinent and interesting when he inquires, "Don't you think your lead editorial in the last *Journal* was a bit too 'sabre rattling?'" Captain Munhall was apparently examining our position rather than opposing it. There is certainly no more important or fundamental issue facing our nation today. Can we assume that all the threats to world peace will resolve themselves at conference tables, and turn away from an intensive preparation for a possible war, in safety? Is the cost of maintaining an alert readiness for such a war, in money and in the diversion of our national energy from the pursuits we would prefer to follow, out of proportion to the risk of being faced with a war for which we were unprepared? That is a question which we believe must be answered individually by our membership, for the guidance of their own position with respect to the issue of inplemented preparedness. As an Association we are actuated by a firm conviction that the safety of our nation and the peace of the world depend strictly upon the thorough readiness of America to meet every potential threat of war with an equal or greater force than any that may be opposed to us.

Coordinating Committee of Military Associations

The Industry-Army Day, the greatest and most significant meeting ever arranged for the purpose of establishing better understanding and cooperation between civilians and the War Department, will be held at the Hotel Stevens in Chicago, January 17. The meeting is sponsored by the Coordinating Committee of Military Associations which represents the following organizations: Chemical Corps Association, Army Ordnance Association, Quartermaster Association, Signal Corps Association, Society of Military Engineers, Association of Military Surgeons, Air Force Association and the Transportation Association. The Chicago Chapters of the various associations are responsible for the arrangements for the meeting. One man from each of the participating associations form the committee. Lt. Col. Elliott Morrill represents the CWA. Mr. Don Compton, Ordnance Association, is chairman of the meeting.

Fifteen hundred prominent representatives from industry, science and other professions will gather from all parts of the country to meet and discuss the present and future plans of the War Department with General Dwight D. Eisenhower and other top-ranking Army Generals.

The history of the Coordinating Committee of Military Associations began at the First National Meeting of the Chemical Warfare Association held at Edgewood Arsenal, Maryland, May 24-25, 1946. At that time the newly-elected president, Col. Ludlow King, presented for the first time a plan for the formation of such a group.

During his presidential acceptance speech, Col. King outlined a broad program which included the active participation of the Association in fields over and above those which were only of direct concern to the group itself. The plan called for closer cooperation between military associations with joint action pointed toward the general improvement of the Army, a healthier public relations program and a stronger national defense.

The plan was then referred to a special committee, headed by Al Leggin, for further study. After approved by the committee in early June a conference was arranged with Lt. General J. Lawton Collins, War Department Director of Information, to discuss the CWA program to obtain an expression from the Army concerning its attitude toward the goals encompassed in the plan. General Collins' favorable consideration and praise added impetus to the movement.

At a later date, Under-Secretary of War, Gen. Kenneth C. Royall, held a conference with Col. King and Col. L. A. Codd, vice president of the Ordnance Association, to further discuss the merits and feasibility of this plan to promote

(Continued on page 56)

LT. GEN. J. LAWTON COLLINS

GEN. JACOB L. DEVERS

MAJ. GEN. LAURIS NORSTAD

Industry-Army Day Program

Hotel Stevens, Chicago, Ill., January 17, 1947

The following is the outline of the Industry-Army Day Conferences in Chicago, Friday, 17 January 1947.

a. Time 12 noon. Chemical Warfare Association luncheon. See hotel bulletin board for location. Off the record presentation of current Chemical Corps program by Maj. Gen. Alden H. Waitt, Chief, Chemical Corps. Arrive at 11:30 a.m.

Time 2:30-4:30 p.m. 8th St. Theater, 741 South Wabash Ave. (one block west of Hotel Stevens). Off-the-record presentation of current War Department program:

Domestic and Foreign Situation, Mission, Requirements, and Plans," Maj. Gen. Lauris Norstad, Director of Plans and Operations.

Problems in manpower, funds and facilities to meet the items in Maj. Gen. Norstad's presentation, Maj. Gen. W. S. Paul, Director of Personnel and Administration.

Legislative Program, Lt. Gen. J. Lawton Collins, Director of Public Information.

Research and Development Program, Maj. Gen. Henry S. Aurand, Director of Research and Development.

b. Time 4:30-6:30 p.m. Free time.

c. Gen. Dwight D. Eisenhower, Chief of Staff, United States Army, will address the entire assembly during the banquet, scheduled for 7 p.m. 17 January 1947, as the keynote speaker. Dress informal. Take seats at 6:45 p.m. Scheduled time of closing, 10:15 p.m.

d. Chemical Warfare Association will be glad to arrange a group breakfast for Saturday morning, 18 January, if the CWA guests would like to meet at that time and discuss phases of the conference. Please notify Joseph Schwimer, Secretary, Chemical Warfare Association, 2153 Florida Ave. N.W., Washington 8, D. C., no later than 10 January as to your pleasure.

e. Chemical Warfare Association will post on the Stevens' bulletin board in the lobby the number of the room it has reserved for headquarters. This room is available to you to meet your friends.

SPECIAL COMMITTEES FOR ARMY-INDUSTRY DAY

Joint Military Association Committee—Mr. Elliott Morrill, Chicago Chapter, CWA Representative; Mr. Carl J. Beckert, 1st Alternate; Lt. Col. Carl S. Casto, 2nd Alternate.

Hotel and Reservations Committee for Guests of the Chicago Chapter—Mr. Joseph E. Hillis, chairman; Mr. R. O. Walker.

Mailing Lists, Allocation of Tickets, Mailing of Tickets and Notices—Mr. Bruce T. Humphreville, chairman; Mr. B. M. Ferguson, Lt. Col. Carl S. Casto, CmlC.

Special Committee for Special Meeting and Social Hour of Chicago Chapter and Invited Guests—Col. Mark B. Chittick, chairman; Col. Preston B. Heller.

Maj. Gen. Willard S. Paul

Maj. Gen. Henry S. Aurand, GSC

Maj. Gen. Floyd L. Parks

Significance of Reppe Chemistry

By DR. M. H. BIGELOW

Dr. M. H. Bigelow, a former Lt. Colonel, served with the Chemical Warfare Service from November 1942 until his return to civilian life in 1946. In 1945, Dr. Bigelow spent many months interviewing Dr. Reppe to compile a record of the many achievements in acetylene chemistry by Dr. Reppe and his group. This report brings forth his impressions of the German scientists and their work.
Dr. Bigelow is now with the Plaskon Division, Libby-Owens-Ford Glass Co., Toledo, Ohio.

DR. J. WALTER REPPE is a chemical genius, of that there is no doubt. In addition, he proved to be a prima donna par excellence. He was quite like a delicate movie camera. Everything had to be in perfect adjustment to get results and in addition a sturdy tripod was necessary to adequately support the mechanism.

Reppe's tripod consisted of three chemists of merit, namely, Dr. Otto Hecht, Dr. Hans Trieschmann and Dr. Kroeper. Without the assistance of these men, Reppe would have been of little value to us. The magnitude of his endeavors had been so extensive that he could have only touched upon the highlights. One must not overlook the fact that at times Reppe supervised over one thousand of Germany's leading chemists.

Dr. Hecht was a comical character, a strange combination of the hunchback of Notre Dame and Punch of Punch and Judy. I never knew whether his body was physically deformed or he had acquired his accentuated stoop from poring over books. He was invariably getting his cane caught between his legs and his tongue tangled with his teeth, but for all his outward appearance, which would have done justice to any circus sideshow, within his head reposed the brain of a physical chemist of exceptional merit.

Before embarking on a long, expansive research program, Hecht would review the reactions involved and could spot instantly whether it could work thermodynamically. If it couldn't work theoretically the project was sidetracked. In addition, Hecht was a walking International Critical Tables. From memory he could quote the physical properties of practically any chemical compound, and with amazing accuracy.

Trieschmann, the second leg of the tripod, was a genius at plant construction. Given a finished research problem, he could build a working commercial plant with speed and accuracy. He knew automatic controls from infra-red rays to the trickiest gadgets man could ever dream of. He would be an important addition to our own chemical industry.

The third leg, Dr. Kroeper, was Reppe's right hand man on carbon monoxide chemistry. Unfortunately, my dealings with this man did not involve chemistry. Through blind obedience to the dictates of his superiors he became involved in the illegal transfer of twenty tons of documents to one of the other occupied zones and ended up with a ten-year jail sentence, which has been justly reduced to two years.

While in my custody, Reppe's office was a veritable mecca of Germany's top-ranking scientists. Some came to pay their respects to the "great Herr Docktor Reppe"; others came as runners in his remote control of the I. G. Farben plant at Ludwigshafen, which little racket he was doing undercover and presumably without my knowledge. The only man who did not show up was his formerly immediate superior, Dr. Ambrose, who had perfectly sound personal reasons for not entering the U. S. Zone of Occupancy.

Who is this man Reppe of whom we are writing? Reppe was, and in his own mind still is, the Director of the Main Research Laboratory of the Interessen Gemeinschaft Farbenindustrie Aktien Gesellschaft (I. G. Farben for short), Germany's leading chemical trust.

He was born in 1892 in Goringen, Germany, as Julius Walter Reppe. He received his doctorate in chemistry from the University of Munich. From the time of his graduation he has worked continuously with the I. G. Farben and rose to a directorate in that company. In the eyes of his co-workers, no greater chemist ever lived, and that view is shared to some degree by some chemists in our own country. Be that as it may, Reppe, with the aid of his corps of co-workers, has opened a new field of research and his name rightfully belongs in the chemical hall of fame.

What is meant when we refer to Reppe chemistry? Using the readily available raw materials, coal and limestone, Reppe, through some very unique chemical reactions made available to Ger-

many and now the world, a host of organic compounds essential to the well-being of human, animal and plant life. Products made, utilizing his new principles of synthesis, ran the gamut from synthetic rubber to artificial blood plasma, with edible fats, detergents and plastics thrown in for good measure.

Reppe's contribution hinges chiefly around a chemical reaction which he has designated as

Dr. J. Walter Reppe

"Ethinylation." This means chemically that one can react acetylene ($HC \equiv CH$) with other chemicals without disturbing the triple bond. Hitherto before reactions involving acetylene were "Vinylations" or the addition took place by destroying the triple bond, giving rise to a substance with two bonds (—C=C–). Even in this sort of reaction Reppe, through proper choice of catalysts, temperature and high pressures, increased the efficiency and simplicity of that reaction.

While ethinylation was not a new reaction as far as literature was concerned, Reppe's real contribution was the introduction of catalysts which brought about excellent commercial yields, approaching the theoretical, utilizing simple equipment and capable of continuous production. Reppe dispelled the fears of explosion associated with the use of acetylene gas at high pressures, and used this gas on a commercial scale at pressures of 200 atmospheres (3,000 p.s.i.).

Reppe's amazing success with the use of acetylene as a raw material comes from the fact that he established the actual role that catalysts played in the reaction. Once knowing the mechanism of the catalytic steps, he was then able to pick and choose the proper catalyst and to predict with remarkable accuracy the efficiency of a given process. In this way the disconcerting trial and error method of research was eliminated.

To reduce the hazards involved in using acetylene at high pressures, Reppe devised some unique apparatus. Deserving some mention at this time, the details of which will appear in a later publication, are the water-ring compression pump, the single-leg compression pump and an explosion proof exhaust valve. In addition, he used nitrogen gas as a diluent and stuffed all large pipes with small tubing.

Fig. 1 shows a diagramatic sketch of a water ring pump. Fig. 2 shows a large pipe filled with small tubing to reduce explosions.

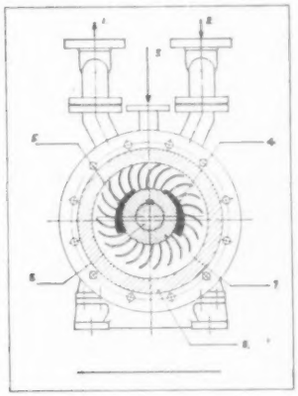

Fig. 1
Cross-section of the water-ring compression pump. 1 and 5, Pressure outlet ports. 2 and 4, Inlet ports. 3, Water control port. 6, Shaft. 7, Eccentric. 8, Water-ring.

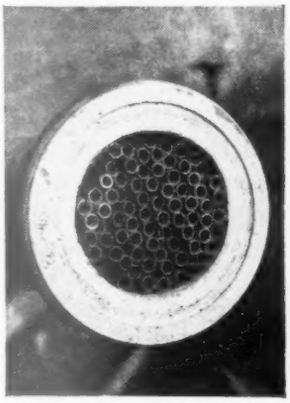

Fig. 2
Method of stuffing large pipes to reduce explosion hazards.

Acetylene is generated by reacting calcium carbide with water. The carbide is made by fusing limestone and coke, utilizing electric furnaces and a large consumption of electricity. With Germany's large sources of coal and limestone, this process was economically sound. Toward the end of the war, when transportation facilities were taxed to a maximum, this process proved too costly. Likewise it holds little interest to American industry. However, Reppe came up with an improved method for manufacturing acetylene. This process consists in burning hydrocarbons and quenching the flame produced with a sheet of water. This process was continuous and produced both acetylene gas and carbon monoxide. By properly regulating the height of the flame and the rate of cooling no carbon or other products are produced. With the improved process for making acetylene available, the interest of British and American industrialists has been aroused.

Ethinylation allows for the production of an important series of chemicals. The chemical steps involved will be illustrated by a few simple examples. Either aliphatic or aromatic aldehydes will react with acetylene to form the correspond-

(continued on page 52)

Dr. Dow Awarded Chemical Industry Medal

Staff Report

Dr. Willard H. Dow, President of the Dow Chemical Co., was highly honored last November when he was awarded the Chemical Industry Medal of the American section of the Society of Chemical Industry at a meeting in New York's Hotel Commodore. The highlight of the award was the sidesplitting speech, "The Personal Side of Willard Henry Dow," made by Dr. William J. Hale, Research Consultant, Dow Chemical Co.

The more than 300 who attended got the inside dope on the early life of the famous Dr. Dow and the many dishes that he enjoys. Dr. Hale traced the success of the Dow Chemical Co. to the fact that free and open discussions were the watchword and that it was the courage and driving force of Dr. Dow that erased all fears for the future of the company.

Dr. Hale took time out to emphasize that the chemist, physicist and biologist will come into their own. He envisaged greater and greater abundance in the future so long as here is no regimentation of the people. In fewer words, Dr. Hale is looking to a great future in the field of chemurgy. Maj. Gen. Alden H. Waitt, who spoke of the scientific accomplishments, said, "When the conflict began, America was without an incendiary bomb, but the effect of the fire raids upon London soon made it apparent that one was needed." Gen. Waitt continued, "We, who were charged with the incendiary program, are grateful to Dr. Dow for the pioneering research he fostered and by which he was able to expand production one hundredfold and meet our seemingly insatiable demands. Not only did Dow multiply their own production of magnesium, but their processes and 'know-how' were made available freely to other producers."

Gen. Waitt referred to the importance of the development of tetraethyl lead in "winning the battle of transportation." He said: "With the spiraling demand for tetraethyl lead in the late 20's and early 30's, many concerns had been attracted by the unlimited supply of bromine in sea water but had abandoned their development efforts as uneconomical. The Dow Co. had been extracting bromine from the Midland brine since the concern was started. With this experience behind him, Willard Dow tackled and solved the problem of extracting bromine from sea water successfully."

Gen. Waitt also revealed a little-publicized side of Dr. Dow, namely, in the field of therapeutic agents. He said that the medalist is "equally at home in a discussion of the biological effects of new drugs on the growth of tissue cells and of the peacetime prospects for the utilization of Buna-S."

Gen. Waitt closed his address by quoting the citation made when Dr. Dow received the degree of doctor of science from the Michigan College of Mining and Technology on June 2, 1939. It read: "A chemical engineer whose basic philosophy is the conservation of nature's resources, a man who appreciates the value of scientific research, a business man with the ability and foresight to select those discoveries and inventions that have great commercial possibilities, a citizen who carries a high sense of public duty."

In response Dr. Dow said that "We have dwelt too much and too long on success in terms of the dollar—too little in terms of humanities." He continued to point out that "looking back we can see how each new advance could have been used to wreck and destroy, or to give unwarranted power to one group or the other, but our great advances have come through men with the vision to see beyond the nearest street corner."

The medalist noted that while the American people are quite willing to laud the scientists and inventors of history for what they gave to humanity, there is a tendency to scrutinize all present-day effort for the profit motive. He declared, "When we try to make a science out of the actions of human nature with the dollar the paramount issue, we must necessarily meet with failure." Dr. Dow believes that false ideologies must be abandoned if progress is to be made and that in place of the concept of the world owing the man a living, the thought that every man owes the world something for the blessings he has inherited from previous generations must be substituted. "The ability of the human race to solve a problem through the use of combined brainpower is the very foundation of our many successes," the speaker continued.

The importance of the electrochemical industry in our daily life is best indicated by the impact that the chlorine industry has made upon our modern society. Dr. Dow said, "When we consider chlorine chemistry alone, starting with the electrolytic decomposition of salt into chlorine and caustic soda, we cannot but be astounded at the effect of electricity and electrochemistry upon our lives. These products of the electrochemistry

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Office of Technical Service

By JOHN GREEN and ROBERT FRYE

THE Office of Technical Services aids in increasing the technological productivity of the nation by collecting scientific and technical information for United States manufacturers and businessmen, colleges and universities, public libraries and similar institutions, and the general public. It was officially organized as an office of the Department of Commerce on July 1, 1946, and is composed of a number of technical units which the Department previously had established or acquired by transfer from other agencies.

In all, the Office consists of five operating divisions. The functions of these divisions are as follows:

I. *The Technical Industrial Intelligence Division* studies enemy scientific, technical and industrial processes and developments; selects and reports on the most valuable items from the enormous wealth of material at hand; and arranges for the transfer of pertinent reports and documents from enemy countries to Washington.

The Division has sent approximately 600 investigators to Germany for the purpose of preparing technical surveys of various branches of German industry. Most of these men have been assigned by American industry and have gone at their companies' expense; their findings are made available to other industries and scientific organizations through OTS, which channels investigations abroad into fields of technology considered most valuable for the American economy.

Experts employed by the Division are selecting and microfilming millions of pages of valuable scientific material located in German laboratories and industrial establishments which cannot be removed to this country. TIID also arranges for the shipment to America and the exploitation here of valuable German machines and pieces of equipment.

II. *The Bibliographic and Reference Division* at present is acquiring and processing wartime scientific and technical information which has heretofore been withheld from the public. It disseminates all of the Technical Industrial Intelligence Division data from Germany and other enemy countries, and also material from Allied sources such as the British Intelligence Objectives Subcommittee and the Combined Intelligence Objectives Subcommittee. Results of wartime research in science and technology financed by or done under the sponsorship of the Federal

John G. Green (seated), Director of Technical Services, Department of Commerce, and Col. Robert Frye, Cml. Res., Assistant Director, OTS, examine a chart captured in Germany.

Government are released to business and industry through the Bibliographic and Reference Division.

This enormous wealth of scientific knowledge is first classified and then abstracted by technical experts in the various fields covered. The *Bibliography of Scientific and Industrial Reports*, published weekly by this unit, contains an average of 800 of these abstracts, arranged by subjects. A master scientific card index, with exhaustive cross-references, is compiled cumulatively, and printed indexes of each volume of the Bibliography are being prepared from these cards. Thus all the scientific knowledge embodied in more than 40,000 documents so far acquired by the Division is easily found by the inquiring research worker.

The reports themselves, after processing, are transferred to an appropriate federal library for permanent reference and for photographic reproduction on order.

The Bibliographic and Reference Division acquires and processes around 1,000 reports a week and receives orders for approximately 5,000 reports a week from business and industry. Nearly 4,000 individual subscribers purchase the Bibliography at an annual cost of $10.

III. *The Inventions and Engineering Division* consists of a group of engineers and industrial specialists which is, in effect, the experts' panel of the OTS. The members of the group investigate, analyze and recommend measures for solving the technical and inventive problems

which confront American businessmen, engineers and inventors. They evaluate inventions and inventive ideas submitted by the American people, and advise inventors how to protect their ideas and develop them along useful lines. The Division tries to bring together good inventions, adequate research facilities and potential manufacturers in order to speed up the industrial and military utilization of inventive ideas.

In response to specific inquiries submitted by businessmen, manufacturers and scientific agencies, the Division provides information embodying results of technical research and experience in manufacturing obtained from both governmental and non-governmental sources.

The I&ED includes the wartime staff of the National Inventors Council and also that of the Technical Advisory Service, which was transferred to the Office of Technical Services in the summer of 1946 from the Smaller War Plants Corp.

The National Inventors Council, which is serviced by members of the Inventions and Engineering Division, is made up of 18 outstanding scientists, engineers and industrialists, who provide their advisory talents on a voluntary basis. It is their responsibility to pass upon all civilian non-commercial inventive ideas of a military nature submitted to the government, and to evaluate their importance to the national security. The NIC, which was organized in 1940, functioned during the war years in close cooperation with the armed services. At the request of the Secretaries of War and Navy Departments and the Congress of the United States, the members of the Council have agreed to maintain their active status and to continue into peacetime the invaluable function which they performed during the national emergency.

Dr. Charles Kettering, Director of Research for General Motors, is the chairman of the organization. Its personnel includes, among others of equal caliber: Dr. Fred Zeder, Vice Chairman of the Board of the Chrysler Corp.; Dr. Oliver Buckley, President of the Bell Telephone Laboratories; Dr. Roger Adams, Chairman of the Board of the American Chemical Society; Dr. William D. Coolidge, Director of Atomic Research for the General Electric Co.

IV. *The Industrial Research and Development Division* is charged with the responsibility of negotiating technical and scientific research contracts with university, government, private nonprofit and industrial laboratories. The projects covered by these contracts must be of a sort which business is not ready to sponsor, whose successful culmination will profit part or all of the nation. During the fiscal year 1946-47, this unit has an appropriation from Congress of $1,500,000 for such contracts, one-third of which is allocated specifically for work at the Bureau of Standards.

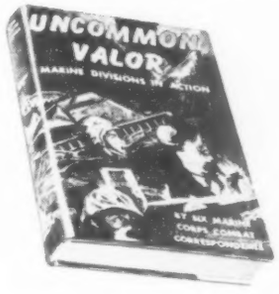
This unit is a peacetime outgrowth of the War Production Board's Office of Production Research and Development, and includes the key personnel of this earlier group. The Division includes experts trained in all branches of industrial technology, capable of handling a wide variety of technological problems.

V. *The Information Staff* disseminates to science and industry the knowledge developed within the Office of Technical Services. In addition, it edits and publishes a monthly scientific magazine to translated into the language of the businessman all scientific findings of the Government which have a practical application in business and industry. It discusses scientific research done under government contracts, and technological developments of friendly foreign nations of interest to American industry. The magazine is called *Federal Science Progress;* the first issue will appear in January 1947.

The value of the Information Staff's work in publicizing the Office of Technical Services store of technological knowledge is demonstrated by a comparison of the current sale of reports with the Staff's publicity releases. Although the small size of the unit limits the preparation of special releases to 1% of the technical reports acquired by OTS, the sales on this 1% constitute more than 50% of the reports purchased by private industry.

The Office of Technical Services is a relatively new addition to the Department of Commerce, but its usefulness to the American economy is already well established. For example, the Reference Section of the Bibliographic and Reference Division handles more than 200 telephone inquiries and 50 personal visits each day. It is obvious that the "technical services" offered by this Office are of genuine value to the business community and to the American people at large.

UNCOMMON VALOR
By Six Marine Combat Correspondents



The story of the six Marine divisions which leapfrogged across the Pacific through some of the bitterest fighting of World War II. Written by men who fought with the divisions they write about.

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German Technical Information

By HARRY A. KUHN, *Colonel, USA (Ret.)*

IT was some six months after the end of World War I before a technical investigating team was sent into Germany to secure information on new chemical developments. This mistake was not repeated at the end of World War II. In April 1944 the Chief, Chemical Corps, was instructed to begin assembling teams of experts to be sent into Germany and the occupied countries to investigate new chemical developments which might be utilized in the further prosecution of the war. In compliance with this directive, technical personnel was selected, all available intelligence information on potential targets was reviewed, and the teams dispatched to London prior to the Normandy invasion. Here they were joined by other investigators, organized into teams, and targets allocated for investigation in France, Belgium and Holland as these target areas were occupied by the Allied armies. The U. S. chemical team arrived in Paris two days after that city was occupied by the U. S. Army.

The initial teams of investigators were concerned primarily with high priority military targets. It was apparent that the investigation of the primarily industrial information to be covered when Germany was occupied would require a much broader organization. Likewise, the Chemical Corps would require more personnel than could be secured from purely military sources. In the period following the occupation of France and prior to the occupation of Germany, the assistance of industry was enlisted by the Service to secure experts in various chemical fields—men who were thoroughly familiar with the German chemical industry prior to the war and of broad experience in the chemical industry in the U. S. who could readily spot new chemical developments. The response of industry to this request of the Service was typical of the 100 percent cooperation between the chemical industry and the Chemical Corps throughout the war. When we crossed the Rhine we had a corps of investigators, civilian and military, waiting in London, which included topnotch industrial chemists of this country.

In the meantime, the scope of the U. S. investigation had expanded with the creation of a number of new agencies which assembled and sent investigators into Germany. In addition to the various Technical Services of the Army, the OSRD, the U. S. Strategic Bombing Survey, the Technical Oil Mission and other agencies had assembled chemical investigators. For purely industrial investigation, a new organization had been established under the sponsorship of the Foreign Economic Administration. This new organization, the Technical Industrial Intelligence Committee (TIIC), included representation from the FEA, WPB, State Department and other agencies.

The actual operation of these investigators in the theater of operations was under the jurisdiction of CIOS, organized by SHAEF on August 21, 1944, to coordinate the exploitation of German technical developments during the war. CIOS was staffed jointly by representatives of the U. K. and of the U. S. It had an administrative field organization extending through the Army groups and the various combat elements of SHAEF which not only combined the latest information on potential targets but formed and dispatched field teams and investigators to the target. It also acted as a coordinating agency for the dissemination of the information secured.

Some idea of the magnitude of the job coordinated by CIOS in London can be secured from the fact that its investigation covered some 33 industrial fields and in 11 months of its existence it compiled and published over 1,200 reports. The work of CIOS was taken over by FIAT on the dissolution of SHAEF on July 13, 1945. FIAT, headquarters now located at Hoechst, is the present coordinating agency for investigation in the British and American Zones in Germany. Since its organization, FIAT has compiled and published almost 1,000 final reports on various phases of industrial investigation of Germany.

From the receipt of the original directive in April 1944 to the present time, the Chemical Corps investigators have played a prominent part in uncovering the secrets of the German chemical industry. The full value both to the Service and to the U. S. chemical industry of the information secured by these chemical investigators only the future will tell. As is now well known, Germany had a tremendous chemical warfare organization. Much of the information secured regarding their chemical warfare preparation is still classified.

A few of the investigations made by Chemical Corps investigators will be cited as illustrations of the type of information which has been made available to the U. S. chemical industry.

It was known prior to D-Day that the Germans had developed a process and had built large

plants to produce high-concentration hydrogen peroxide. This was being used as a propellant in torpedoes, submarines and V-2 bombs, and every effort was made by the chemical investigators in France and Belgium to secure all the information possible on the subject. It was also high on the list of priority targets for the chemical investigators as they moved across the Rhine. When the plants producing high-concentration peroxide were finally located in Germany, a special team of experts was assembled in this country by the Chemical Corps and dispatched to Germany to make a complete investigation. This team spent four months investigating the operation in the principal plants and an additional four months in assembling and analyzing the data they secured. This report, a volume of more than 350 pages, was recently released to the public and constitutes the most complete authority on the manufacture and handling of high-concentration (80%) hydrogen peroxide.

The early chemical investigators in the Rhineland discovered that the German chlorine plants had replaced the diaphragm type cell with a mercury type chlorine cell. This cell produces high concentration caustic of high purity which can be used commercially without further concentration or purification after it leaves the cell. Since caustic soda is a by-product of the chlorine plants at our four arsenals which must be disposed of to commercial channels, this Service is very much interested in a cell which would involve the minimum diversion of effort from the chemical manufacturing at the arsenal and it has very actively prosecuted a complete investigation of the German chlorine plants. After preliminary reports had been received from the initial investigating teams in Germany on the chlorine plants, this Service organized, with the assistance of the other government agencies concerned and industry, a team of the leading mercury cell experts in the U. S. Early this year this team proceeded to Germany, where they spent four months investigating in detail the operation of the mercury cells. These cells are of three types, two of them horizontal. These horizontal cells differ principally in length, one being 7 meters and the other 14 meters long. The newest mercury cell development was the so-called vertical type which, although used commercially in four plants in Germany, is still somewhat experimental. This vertical cell is of particular interest because it occupies only half the floor space necessary for other types of the mercury cell.

The industry chlorine team in Germany, in addition to securing cost and operating data, secured tracings of more than 100 detailed drawings of the various types of cell. This Service arranged to have these drawings reproduced and distributed to industry at cost. These drawings and the reports of the investigating teams made available to industry a tremendous amount of research and development work costing hundreds of thousands of dollars. It is believed they will prove of inestimable value to the future development of the chlorine industry in the U. S.

The early chemical investigators found that acetylene occupied a position of abnormal importance in the German chemical industry. Because of a shortage of hydrocarbons obtainable by cracking petroleum, acetylene was used as a starting material for a large number of chemical products. While the chemistry of acetylene reactions was published in very early reports of the Chemical Corps investigators, it has only been recently that the engineering data incidental to the reactions and the application of these to commercial usage has been investigated. In fact, several of the early Chemical Corps investigators are now in Germany exploring this subject further.

While most of the acetylene was made by the calcium carbide route, new methods of production were introduced on a large scale, including the production by electro-thermal cracking of hydrocarbons in natural and refinery tail gas. One large plant was producing 200 tons per day using this arc process. Another method of interest to the U. S. chemical industry was the production of acetylene by the partial oxidation of methane. One of the most striking achievements was the working out of safe conditions for handling acetylene under pressure up to 20-25 atmospheres and temperatures up to 200° C. Full disclosure of these engineering achievements will free the chemical industry from the limitations imposed previously on the chemistry of acetylene, and will undoubtedly result in a wider application of acetylene as a raw material in this country.

The early investigations of the chemical investigators in the textile fibers field was continued by a textile team from the Quartermaster Corps as well as teams sent by the Textile Subcommittee of TIIC. The wartime development in the synthetic fiber field in Germany is characterized by the success with which they made themselves independent of foreign raw materials for fibers. The Textile Institute, Inc., has recently compiled the German synthetic fiber research and development into a book which should be a stimulant to research in textiles of all kinds.

While the investigation of the German synthetic fuel developments did not fall within the

scope of investigations outlined for the early Chemical Corps investigators, these developments furnished the bases for so many chemical processes that our investigators of necessity included it in their field.

The most extensively used process for the production of crude oil and gasoline in Germany was the Bergius process for the direct hydrogenation of coal. The principles of this process were well known in this country but the commercial application by which Germany produced over 3,000,000 tons per year of oil and gasoline was of great interest from an engineering viewpoint. The development of a process for hydrogenation of coal in the mine offers great promise for the future of both the coal and oil industries.

The investigation of the indirect hydrogenation process, known as the Fischer-Tropsch process, in which coal, lignite or natural gas is first converted to water gas, a mixture of carbon monoxide and hydrogen, is of great chemical interest due to the by-products obtained. In this process, the mixture of gases in proper proportions and after suitable purification is passed over a solid catalyst at relatively low pressures (1-20 atmospheres) and temperatures ranging from 120°-260° C. The products obtained are gasoline, diesel oil, liquefiable gases and paraffin waxes. The byproducts are organic bases, alcohols, etc., which furnish the starting point for a number of chemical products. The information obtained on this process has already been applied commercially in this country by the construction of a large scale plant in Texas.

These examples are only a few of the technical investigations that have been made of the German chemical industry. Thousands of investigators have visited Germany and surveyed in detail hundreds of plants. Literally millions of pages of data have been accumulated in the chemical field alone and more than 2,000 reports and 500 microfilms of German reports, patents and other documents have been made available to the chemical industry in this country. The microfilms alone represent about one-half million pages of reading matter and are exclusive of the more than 225 microfilms of synthetic fuel data on which the titles alone cover more than 350 typewritten pages. More reports and microfilms are being received in Washington daily. Such a wealth of technical information has never been assembled before and may never be again.

There are undoubtedly in this tremendous mass of information items of value to every phase of the chemical industry. It is obvious that the flow of reports has been in too great a volume to be digested. The Chemicals Unit and Office of Technical Services have done a remarkable job with the funds and facilities available in securing and releasing the reports to the public, but the job of coordinating and evaluating this information can only be solved by the same cooperative effort of government and industry that assembled the reports.

No attempt has been made to segregate this enormous mass of information into categories, collect pertinent information on given subjects from all possible sources, analyze, correlate and evaluate this information and thus prepare a complete index and cross-index. There is no question that a critical study and evaluation of all this mass of data and an exhaustive index will be of tremendous interest to the chemical industry, the chemical profession, the universities and a stimulation to future research. A systematic presentation of the available information will undoubtedly help chemical industries to develop new processes much more quickly and with less expenditure on research and pilot plant studies than will be the case otherwise. This is a job which takes both brains and money. It isn't a job that can be done by any government organization alone. It requires a certain amount of pick and shovel work to sift and screen the thousands of reports and miles of microfilm but it requires supervision and evaluation of experts in various phases of the chemical industry to combine and correlate similar material. Every agency, government and private, interested in the future of the chemical industry should be interested in seeing this job done and done just as effectively as was the job of making the original investigations in Germany.

This is a picture to win the heart of an Editor. The *Journal*, which views with healthy scepticism the Executive's ornate desk, virginal save for a $40.00 desk set and a bowl of pink rosebuds, wagers that Henry Fischer can lay his hands on anything he wants on this desk in 10 seconds flat. And it looks as though anything he *might* want *is* on the desk.

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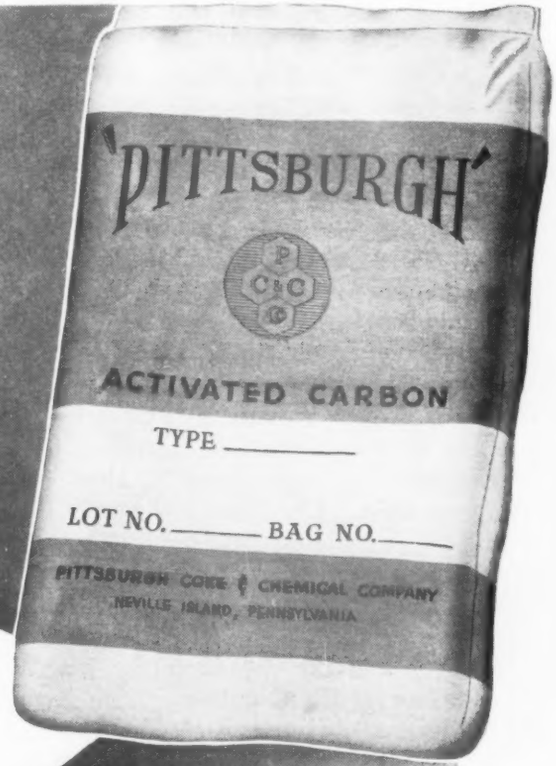

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Coordination and Research

Speech by Robert T. Baldwin, Treasurer, American Chemical Society and Chlorine Institute, Inc., at the meeting of the New York Chapter, Chemical Warfare Association, 20 November 1946.

Speaking for himself, and as Mr. Baldwin put it, "for myself only," he said:

The following observations are based on the general thoughts that there is nothing more difficult in the chemical and closely related fields than research and that the most threadbare words heard each day in those fields are "coordination" and "research." It is understood that the Chemical Corps has determined upon research of its own doing coordinated with research by outside agencies. That is a program of no mean order, especially as the Corps must deal with offense as well as defense. "Biological warfare" alone is an enormous subject.

The latest census of the National Research Council shows about 2,440 industrial laboratories in this country with a professional, technical, administrative, clerical and maintenance personnel of about 133,000. Over 46,000 of this personnel are chemists, engineers, metallurgists and physicists, the chemists and engineers being about 20,000 each. There are also 292 colleges and universities offering research service to industry. We are, indeed, fortunate to have such resources. They help mightily in any plan of national defense. However, the mere size of these resources should make us reflect that there are limits to use of them. Overlapping and lack of coordination within the requirements of the Chemical Corps can provide confusion and waste of time and money; and, if two or more branches of the armed services should have the same given objective, the result, in the absence of coordination, will leave much to be desired. These vital matters have recently been discussed at length by Dr. Roger Adams in "Chemical Research in the War and Postwar Periods," Chemical and Engineering News, June 25, 1946, pages 1643-1647 and 1755. Dr. Adams is highly qualified and his paper includes first hand observation of foreign research methods.

Your speaker also calls to your attention the recent address by Maj. Gen. H. S. Aurand, Director, Research and Development Division, War Department General Staff, entitled "The Army's Research Program," printed in *Mechanical Engineering*, September 1946. This deals largely with the all-over authority, delegation of authority, committees, panels, etc. At the time the address was given, the makeup of some advisory groups was still to be determined. Your speaker offers the suggestion that somewhere in the Chemical Corps plan there be recruited not only representatives of the Corps and scientists, but a few executives of chemical enterprises. Such executives could be very useful. To the extent that the chemical industry resources will be used, these executives will be responsible for results at their respective plants. So why not have their counsel beforehand?

Coordination

There is already plenty of comment that the armed forces, as never before, are employing scientists on problems of national defense and that the secrecy put around the work tends to degrade the scientist and to make the state all-powerful. It seems to the speaker that the days of bow and arrow warfare have been over for

Mr. Robert T. Baldwin, Treasurer of the American Chemical Society and Secretary-Treasurer of the Chlorine Institute, Inc., sparked the enthusiastic meeting of the New York Chapter, Chemical Warfare Association, held at 2 Park Avenue, 20 November 1946.

some time; that it is futile to invent a powerful national defense and tell the world about it; that the scientists, by their work, can do more than any other single group to keep the world at peace.

There is also comment that the armed services do not always put their problems concretely to the scientist. This may be true, but it is also probable that the scientist cannot always readily communicate his science to the armed services. Time will do much to provide a better mutual understanding. However, the Office of War Mobilization and Reconversion have recently begun a study of Federal and private research programs and according to the *Journal of Commerce*, on the 14th inst., their inquiry runs as follows:

"*List of Problems Posed.* 1. Is the present dominance in scientific research of Government projects for the Army and Navy resulting in serious neglect of 'fundamental' science as opposed to applied science and of certain fields of science such as biology?

"2. Do present Government research projects, originating with separate Government agencies without over-all planning, involve duplication and overlapping of efforts?

"3. What is the effect of Government research on the use of available scientific personnel and what provision is being made for training an enlarged scientific force?

"4. What will be the consequences of the tremendous increase in Federally-sponsored scientific research and the absolute decline in private industrial research?

"Also slated for investigation is the wide disparity of the policies now pursued by different Government agencies regarding the patent rights of the Government covering inventions resulting from Federally-financed research."

In any event, ideas and suggestions for improvements and new things will flow both ways and suitable strainers will be necessary. Indeed, if the Chemical Corps publicity engages the attention of the public, there may be suggestions received from persons entirely outside the formalities of the planning. This condition is good or bad, depending on how you look at it. Your speaker recalls that, in the first year of World War II, a special civilian group authorized to deal with alleged inventions from the general public handled upwards of three hundred ideas, of which two appeared to warrant consideration. On the other hand, another special group within the chemical field painstakingly investigated every suggestion received from chemical sources on the ground that the more crazy they seemed on first reading, the more they required attention.

Research often fails of its goal and yet may provide byproducts of value. Indeed, a by-product may be of greater use or value than the thing sought. Contracts for research should provide for such eventualities.

Research by Chemical Industry

Assuming that the Chemical Corps has specific military problems in applied chemistry, there are at least four groups whose services can be enlisted—the colleges, the foundations, the chemical consultant, and the chemical industry. Let us consider the last named first on the assumption that the industry will be surveyed at intervals and that it will receive trial orders for new materials. It is suggested that the surveys might include not only a catalogue of current capacity and product, but the relation of the capacity and product, and laboratory facilities, to a military program. Laboratory facilities cannot be taken for granted in this age of specialization. A laboratory largely devoted to products based on one or two raw materials should be known and recognized as such and not be expected to improvise overnight. There are plenty of facilities of numerous kinds and those best fitted for a particular part of a program should specialize. In the next war, there will probably be no time either to improvise or to perform miracles on short notice. Industry is not warminded and it is folly to suppose that, incident to its operations, it will of itself turn out new weapons of war. If the Chemical Corps wishes to improve what it now has or to procure better weapons, it must translate those matters to the chemical industry and either secure its needs or know exactly when and how much can be had in an emergency, and thereafter made as wanted. The time to prepare is now in order that peace may continue.

It seems obvious that some of our weapons are already obsolete and World War II tends to retreat into the same place where a shrunken World War I lies. It will be asking too much to rely on what we have in any one year of either peace or war. We cannot rely in wartime on button pressing, on good intentions, on sorting the good and the bad ideas of hopeful inventors and crackpots. Never before in our history have we been able to see the long labors in research for chemical ways and means of our enemy as we now see in the Bibliography of Scientific and Industrial Reports of the U. S. Department of Commerce. The speaker has been told that the German effort is not so remarkable. There appear to be several answers to this thought—

(Continued on page 47)

War Department Research and Development

Reprinted by courtesy of Chemical and Engineering News, American Chemical Society

By AL LEGGIN

WORLD WAR II has convinced the military authorities that the future of our military strength is dependent upon the achievements and discoveries of our scientists. Already the weapons of this war are obsolete and present research and engineering programs in the fields of atomic energy, radar, guided missiles and bacteriological warfare are certain to revolutionize future strategy and tactics.

The War Department realizes that to keep the Army equal or superior to any other military force in the world the field of scientific and technological development must be fully exploited, and that this can be accomplished only by close integration of civilian and military talent in peacetime.

The responsibility for achieving this integration has been consolidated and organized under the War Department General Staff as the Research and Development Division, which operates as an equal with the other "G" divisions such as Intelligence, Operations, and Supply.

The director, Maj. Gen. Henry S. Aurand, has complete responsibility for the application of natural scientific resources to the solution of military problems. He is the adviser to the Secretary of War and the Chief of Staff on all War Department matters relating to research and development. He has over-all responsibility for the initiation, allocation, coordination, and progress of research and development programs, demonstration of new or improved weapons, military equipment and techniques of their employment to the using services, and the mobilization of the scientific effort for carrying forward this research and development program.

General Aurand, a West Pointer, is a former ordnance officer and graduate of the Army War College and Army Industrial College. In the years prior to the war he assisted in the design and construction of Aberdeen Proving Grounds, Maryland, and later took charge of the development work at Sandy Hook Proving Ground.

He has been ordnance officer of the Philippines and also the Fifth Corps Area. In the 30's General Aurand prepared an Ordnance Field Manual, acted as instructor at various Army schools, and was in charge of the technical group at Picatinny Arsenal. During World War II he was director of the International Division, Headquarters, Army Service Forces; Commanding General of the Sixth Service Command; Deputy Chief of Ordnance, Communications Zone, European Theater of Operations; Commanding General, Normandy Base Section; Commanding General, Army Service Forces in the China Theater; and Commanding General, Africa-Middle East Theater.

LT. COL. AL LEGGIN, *Cml. Res.*
Public Relations Officer

The Research and Development Division is essentially a coordinating and policy-forming group. The operation of military research and development establishments, such as arsenals, laboratories, and proving grounds, and the letting of research and development contracts with universities and industry will continue to be controlled by the technical services—i.e., Ordnance, Air Corps, Chemical Corps—as in the past, but the division of responsibility for various projects will be subject to the division's approval.

Gen. Dwight D. Eisenhower, when he established this new division in April, laid down the following five guiding policies of the organization:

1. The Army must have civilian assistance in military planning as well as for the production of weapons.

2. Scientists and industrialists must be given the greatest possible freedom to carry out their research.

3. The possibility of utilizing some of our industrial and technological resources as organic parts of our military structure in time of emergency should be carefully examined.

4. Within the Army we must separate responsibility for research and development from the functions of procurement, purchase, storage, and distribution.

5. Officers of all arms and services must become fully aware of the advantages which the Army can derive from the close integration of

civilian talent with military plans and developments.

Guided by these principles, the organization is now proceeding to establish a working team of Army officers and scientists. The first move to give civilian scientists an active part in the program was the appointment of Cloyd Heck Marvin as deputy director for research. Dr. Marvin, who is president of George Washington University, Washington, D. C., will be the voice for the civilian scientists in the Army research program, acting as adviser to the War Department and liaison with scientists prominent in the various fields of science. Dr. Marvin had a prominent part before and during the war in the development of the atom bomb. President of George Washington University since 1927, he promoted development of nuclear physics which led to the splitting of the atom by installing research studies there during the early 30's.

The position is for one year and it will be held by top-flight scientists from various fields with different experience and background; even different geographic locations will be given consideration.

A civilian panel of outstanding scientists and engineers, representing both the natural and social sciences, is being created. Initially this will be composed of 75 specialists in various fields, appointed for one year. There will be no meetings of the members, but problems will be forwarded to the appropriate specialists. The panel member may select his special committee from other members of the panel or from scientists in his field not included in the panel. Gen. Aurand feels that most can be accomplished by permitting these specialists to operate in the manner they think best.

Civilian scientists are also being utilized within the division, in full or part-time positions. Many, such as H. T. Wensel, physicist; D. M. Delo, scientific personnel specialist; and P. S. Siple, biogeographer, formerly a member of the Byrd Antarctic expedition, are employed on a full-time civil service status. Part-time consultants from industry and universities to aid in many problems are also being employed. The division is contracting with George Washington University to furnish scientific personnel with special scientific skills.

Scientific personnel, however, cannot solve all the research and development problems of the Army, since they are not military strategists and cannot anticipate all the problems encountered by the Army during war. On the other hand, military men cannot always visualize the military possibilities of many scientific achievements. To coordinate the knowledge of these two fields a development group, composed of military men, has been set up under the direction of Brig. Gen. E. S. Hoag. This group, from one end, will present the user's problems to the scientists and, on the other hand, take the scientific developments to the tacticians and strategists and see if they can be of value.

Further to accomplish the mission of scientific cooperation the Scientific Liaison Group has been formed. Contact will be kept with scientific and engineering societies, universities, and research laboratories to exchange information and views.

An additional duty of the Scientific Liaison Group is to supervise the declassification and passing on to the Publication Board, Department of Commerce, of information on government-sponsored research and development or information obtained from enemy sources which would be of value to science and industry.

During the war many research projects duplicated each other to a certain extent. Since the end of the war, the services have continued work on projects to meet their own needs. For example, both Ordnance and the Air Corps are carrying on work with guided missiles. Often problems which one group is working out have already been solved by the other group.

The division is now making every effort to place the responsibility for a program under one service or the other, and Gen. Aurand states that duplication of research projects is being eliminated rapidly, and many unimportant or "deadwood" programs are being canceled. The number of projects has been reduced from 5,500 to approximately 4,400. This does not indicate a curtailment in research, but a concentration of effort.

There is not only duplication of effort within the Army itself, but many high priority projects are also being duplicated by the Navy. The Army has two methods of coordinating its programs with the Navy. The first is to have the technical services deal directly with their counterpart in the Navy. Should no successful arrangement be worked out, the coordination is worked out by the Joint Research and Development Board consisting of two Army and two Navy officers, all of high rank, and the chairman, Vannevar Bush, head of the Office of Scientific Research and Development. This superboard authorized by both the Secretaries of War and the Navy has the power to allocate the research project to the Army or Navy and eliminate much of the inter-service rivalry.

(Continued on page 49)

Chemical Corps Research and Development

Reprinted by courtesy of Chemical and Engineering News, American Chemical Society

By AL LEGGIN

PRIOR to the late war the research and development of chemical warfare was devoted mainly to toxic chemical agents and the necessary protective equipment. However, the war with its many scientific achievements necessitated the expansion of chemical warfare activities into new fields such as biological warfare, incendiaries, flame throwers, and large-scale smoke screens.

The Chemical Corps (formerly the Chemical Warfare Service) has always been closely linked with the chemical industry and research institutions since the activities of both groups have been dependent on each other. In the future even greater cooperation will be required to keep the Chemical Corps abreast of the chemical and biological developments.

Civilian scientists and the Chemical Corps, however, now have a mutual meeting ground since the Chief of the Chemical Corps, Maj. Gen. Alden H. Waitt, a member of the *American Chemical Society*, is well qualified to direct this technical service since he holds a master of science degree from Massachusetts Institute of Technology, and was for two years a member of the staff of the Research Laboratory of Applied Chemistry. Prior to his entry in the Army in 1917 he was a chemistry instructor at the University of Kentucky. Since he received his Regular Army commission in 1920 he has served with many varied branches of the Army, including the Air Corps, Infantry, Armored Corps, and the General Staff.

In promoting its research and development program the Chemical Corps is planning to utilize the services of civilian scientists to the greatest degree by employing qualified scientists within its organization, contracting with universities and industrial research organizations on research and development problems, and utilizing civilian advisory boards and consultants. At the present time approximately 400 professional grade employees are with the Research and Development Division. Top scientific control will also be in the hands of the best available technical men, since each of the three main branches—chemical, medical, and biological—will be headed by a civilian technical director. A civilian scientist, as scientific adviser to the Chief of the Chemical Corps, will coordinate all research and development.

To supplement the technical facilities of the Chemical Corps, at present there are more than 100 contracts, valued at $2,000,000, with outside research institutions for specific problems. This is a great advancement over the prewar period when the Chemical Corps spent only a few dollars for such projects.

Civilian industrial and scientific advisers have now been selected for various boards. The Research Council of the Chemical Corps Advisory Board, headed by W. Albert Noyes, Jr., president-elect of the American Chemical Society, will guide the over-all research and development program. In addition, the American Chemical Society is also appointing an advisory committee to cooperate with the Chemical Corps on research and development projects relating to the chemical field.

To encourage civilian scientists further to participate in its research program, the Chemical Corps is encouraging the publication of papers by its research workers. Several hundred papers are now appearing in various scientific journals. At a recent scientific meeting 24 papers were presented by the workers of one of the research divisions.

The Office of Research and Development of the Chemical Corps, headed by Col. Charles E. Loucks, has recently been reorganized and activities of the $6,000,000 research and development program are now being carried on at the following six installations: Biological Division, Camp Detrick, Md.; Medical Division, Edgewood Arsenal, Md.; Edgewood Proving Ground; San Jose Project, Panama Canal Zone; and Dugway Proving Ground, Tooele, Utah.

Subjects of Research

The center of the chemical research activities is the Technical Command whose functions include research on toxic chemical agents, incendiaries, screening and signaling smokes, flame throwers, chemical mortars, and generators; the development of equipment and clothing for protection against enemy use of chemical warfare agents; and the development of insecticides, rodenticides, and fungicides. The command, housed in a $1,500,000 laboratory and staffed by 250 professional and subprofessional employees, 10 per cent of whom hold Ph.D. degrees, is equipped to carry on the major part of its re-

search program. Numerous contracts, however, have been negotiated with universities, industrial research laboratories, and government agencies to conduct specific types of research.

The basic research projects being conducted by outside institutions include the study of the fundamental theories of the dissipation of fogs and smoke at the University of Washington. This project is conducted in cooperation with the Air Forces and may be useful in eliminating fogs at airports. In a cooperative program, several universities are now studying turbulent and eddy diffusion of aerosols and particulates and aerosol size distribution. Other basic research programs which may be useful to science in general include the study of adsorption, adsorbents, and the structure of activated charcoal; the entropies of phosphorus; and basic theories of nozzles.

The heaviest responsibility for research lies with the Biological Division, headed by O. C. Woolpert, formerly head of the bacteriological department, Ohio State University Medical School. The center of biological research is Camp Detrick, Frederick, Md., which was established in April 1943 at the request of the War Research Service. Biological warfare can be defined as the use of bacteria, fungi, viruses, rickettsias, and toxic agents from living organisms (as distinguished from synthetic chemicals used as gases or poisons) to produce death or disease in men, animals, or plants. This new weapon of the late war, like toxic gas, was never used but remains as a weapon of undoubted potentiality.

The United States entered the field of biological warfare through necessity and the research was aimed primarily toward securing protection for this nation and its troops against the possible use of biological warfare agents by our enemies. To develop the techniques of defense, the whole range of biological warfare, including the offensive potentialities, was explored. Consequently, the research workers made many accomplishments during the war such as the development of methods for the mass production of microorganisms; production and isolation of a new crystalline botulinus toxin, and development and production of effective toxoids to protect large masses of individuals. However, in studying this method of waging war many contributions were made to biology and medicine, such as the studies of development of immunity in human beings and animals to certain infectious diseases; the control of airborne disease-producing agents; studies on the effects of more than 1,000 different chemical agents on living plants; development of a vaccine for rinderpest, quantities of which are now being used in China for the protection of its livestock; development of new weed killers; and the use of new antibiotics such as streptomycin and streptothricin. These achievements are remarkable, but work in this field is being continued, at the research facilities at Camp Detrick, to provide an adequate defense against any biological attack.

In addition to the projects at Camp Detrick many contracts have been awarded to various civilian research institutions for specific problems. At Harvard and Northwestern Universities work is under way on studies relating to the "Gucker counter," an instrument for detecting and counting microorganisms or other particles in a cloud. Yale University is investigating the metabolic defects leading to death in *B. tularense* infection. In the field of antibiotics several universities are now undertaking investigations to determine their actions on the metabolism of microorganisms. A number of studies relating to mussel poisoning are also being pursued.

These plague and pestilence warfare studies, although grim and macabre, may bring beneficial results to mankind by eventually leading to the control of many diseases of humans and plants.

The Medical Division, headed by Col. John R. Wood, has the primary responsibility of the medical aspects of Chemical Warfare such as the protection against toxic agents and the treatment of injuries received from these agents. However, the research projects conducted by this division have led to many developments which are of great potential importance to nonmilitary science.

The foremost contribution at present is the use of BAL, 2,3-dimercaptopropanol, for treatment of metallic poisons. BAL was discovered by R. A. Peters of Oxford University as a treatment for lewisite arsenic poisoning. This compound proved so successful in this treatment that it is now being used as a routine treatment, by injection, for arsenic and mercury poisoning. Experiments are now being continued on cadmium and zinc poisoning with promising results. BAL glucoside, also used in cadmium poisoning treatments, is now being tested on lead poisoning with hopeful results. These compounds are available commercially to physicians.

Another war gas protective compound proving successful in nonmilitary medical treatments is PAPP, *p*-aminopropriophenone, which is being studied as a protection against cyanide poisoning. This treatment is far more satisfactory than any other, since it causes no disabling side reactions.

Two toxic war gases which are now being

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Educational Committee

By COL. W. HEPBURN CHAMBERLAIN, *Cml Res.*

The Executive Committee has asked that I temporarily head up the Educational Committee of the Chemical Corps Association. By educational, we do not mean "training" in any sense, as that is the province of the War Department through various Reserve activities. Our Committee will try to disseminate Chemical Corps activities and plans to the Chemical Warfare Alumni, and to Industry.

The Chemical Corps Association, in my mind, was established for four main purposes: (a) To keep the interest of all of the men and women who were in the service—to primarily build up good fellowship; (b) to hold and build up the interest of our "alumni" and industry in national defense; (c) to keep Industry interested and posted on Chemical Corps requirements for chemicals and other products used by our Service, and thus help Industry to obtain the overall chemical requirements of the Federal Government for chemicals required in a major war effort; (d) to increase the interest and knowledge of the public in the Chemical Corps and thus aid the Corps activities.

The prime requisite is an active and interested membership in the Chemical Corps Association. We have an excellent start, but to date, the membership is largely made up of officers from the Office of the Chief and from the various Procurement Districts throughout the country. To date, there are about 2600 members—a mere scratch on our potential, and of course, this membership must be built up as rapidly as possible. There is a potential of over 38,000 from the officer and enlisted cadres plus a large number from Industry —both technical and industrial. As yet, the association has had little to offer and it is recognized that every potential member has many calls for his money for necessary memberships in business associations. Therefore, the Association must really *give* something to make it worth while to them. It is my feeling that the easiest way is through good fellowship, and thus establish a mutual interest. Informal and fairly frequent get-togethers where lies and experience can be swapped with a minimum of serious and yet authentic information on national defense activities will help our attendance to rapidly grow. From experience, I know that attendance of a minimum of 50 percent of members can be counted on. I want to encourage the building up of membership as rapidly as possible, but only on a sound basis.

So far, membership drives have been towards officers, as they are the only potential that we have where addresses are possible through the Chief's office. Officers, enlisted men and civilians are all wanted, and we ask that every time you know the address—either business or home of an ex-CWSite, that you send in the address promptly. Do not try to oversell him on membership. Let *us* show him that it is worth while to belong, that he will be kept posted on activities, and above all, through address lists which we plan to publish with your cooperation, he will be able to keep in touch with his many friends of the Service. It is my feeling, again based on experience, that local papers are glad to carry notices of activities, and if the organized chapters will advise the papers well in advance that there will be a Chemical Corps Association meeting, and that all "Alumni" are invited to attend—followed up a few days before the meeting by a new insertion in the paper giving time and place—that very rapidly an active and interested attendance will be regular.

I emphasize again, that at the present time, the greatest help you can give us is to help build up an accurate address list of our alumni. We, in return for your help, will send you the addresses of any we know in your area.

It is our plan to give to you all of the "not classified" information that we can obtain from the Chemical Corps on their research and development activities; their estimates of probable requirements of materials, and as much indication as possible on their thoughts for the future. General Waitt has promised his whole-hearted cooperation and that of the Corps. We also hope to be able to help Industry get the overall requirements of any product by guiding them to sources of information. We hope that eventually the government will set up a focal point where direct and indirect requirements for a product can be obtained by interested producers. Again from experience, I know that during the war Industry was unable to obtain even the direct requirements, and that the overall demand was many times that officially and authoritatively given out. This lack of information greatly delayed the delivery of materials, for it was almost impossible to "sell" the military services on the need for new plants for they would not recognize "indirect" requirements. In other words, I feel

(Continued on page 50)

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Raw materials used by the Lambert Pharmacal Company are carefully assayed in our Analytical Laboratory. The titration table shown in this photograph is typical of such equipment used in the Analytical Laboratory. Carefully standardized solutions automatically supply the burettes used by the analyst in carrying out such assays.

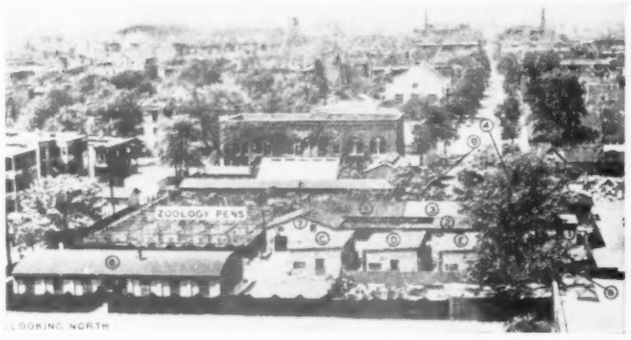
For the precise determination of small amounts of certain chemicals, the spectrophotometer, shown here in use, utilizes the "electric eye". It is far more sensitive than the human eye. In pharmaceutical manufacture small amounts of contaminating materials can have a deleterious effect on the final product. The spectrophotometer is constantly used in the Lambert laboratories to determine the amount of contaminating elements in raw materials.

Rabbits have been utilized by Lambert in its dandruff research. The rabbits were inoculated with Pityrosporum ovale; which is believed by many dermatologists to be a causative agent of infectious dandruff. After infectious dandruff developed the rabbits were treated, on one side only, with Listerine Antiseptic once a day. Marked improvement on the treated side was noted within 14 days on the average. The untreated side of the rabbit showed typical evidence of dandruff even a month after inoculation.

LAMBERT PHARMACAL COMPANY
St. Louis, Mo.

Toxicity Laboratory, University of Chicago

By GEORGE H. MANGUN
Assistant Director, Toxicity Laboratory



Across the street from Abbott Hall, University of Chicago, a group of small tile and brick buildings sits snugly inside an eight-foot wooden fence topped with several strands of forbidding barbed wire. A close inspection of these buildings reveals an interesting and unusual structural feature about most of them—along their walls run huge metal pipes out of all proportion to the other features of the buildings. These pipes originate in a maze of hoods and vents inside each laboratory and travel thence underground to the base of the university incinerator stack nearby.

This is the University of Chicago Toxicity Laboratory, a war-born project that contributed much to our knowledge of chemical warfare and promises to contribute even more to the peace that follows. Through these large pipes powerful motors propel the air from each laboratory—air often laden with strange and deadly compounds. Once every minute the air is completely refreshed in each laboratory to protect investigators from possible poisonous effects of minute quantities of toxic compounds that may escape into the room atmosphere.

During the war thousands of compounds from throughout the allied world and from enemy sources found their way into the Toxicity Laboratory for testing as potential chemical warfare agents or for use in protecting against them. In laboratories throughout the nation chemists were synthesizing new compounds that might prove more effective than any known before. In most instances little or nothing was known about their effects on man, and until the "Tox Lab" had tested them against suitable animals, no man could say how nor in what amounts they might strike a fatal blow against the human body. It was the mission of the Tox Lab to evaluate these new compounds as potential chemical warfare agents —to reject those of little promise and in conjunction with the Chemical Corps to accelerate the development of those substances which proved themselves of extraordinary potence and otherwise suited to the rigorous demands required for use in combat.

At the inception of World War II, in chemical warfare as in other phases of military activity, it suddenly became necessary for the Government, Army and Navy to call upon the universities for assistance in solving the urgent technical problems that arose. Scientists generally had no knowledge of the current state of developments in chemical warfare and therefore no appreciation of the problems involved nor of how they might best contribute toward winning the war. Only because of the providential events that delayed the final test of strength was it possible for scientists in the universities to reach a full understanding of the problems and in collaboration with military personnel to make decisive contributions to the final victory.

The Tox Lab originated under a contract of the University of Chicago with the National Defense Research Committee of the Council of National Defense in April, 1941, following negotiations initiated by Professor E. M. K. Geiling, Professor of Pharmacology in the University. The contract eventually came under the Office of Scientific Research and Development, and finally under a direct contract with the Medical Division, Office of the Chief, Chemical Warfare Service, in April, 1945. Until that time Dr. Geiling was official investigator, and since then he has been associated with the laboratory in an advisory capacity.

The laboratory began actual experimental work in May, 1941, following completion of the first laboratory unit and animal quarters. The first director of the laboratory was Franklin C. McLean, Professor of Pathological Physiology in the University, who later resigned to accept a commission of Lieutenant Colonel, Medical Corps, for service with the Medical Division, OC-CWS. Under his able direction the laboratory plunged into the problem of evaluating the toxicity, vesicancy and systemic and irritant action of a wide variety of new and of well known compounds. With the help of a machine designed by Matthew Benesh, Chief Engineer in charge of Research and Testing for the Peoples Gas, Light

and Coke Company, Chicago, the laboratory staff was able to expose mice to large numbers of compounds rapidly and systematically. There was a healthful exchange of personnel between the laboratory and the various installations of CWS, and even British, Canadian and Australian testing stations. The Bureau of Medicine and Surgery, U. S. Navy, likewise participated in the program. With the cooperation of Great Lakes Training Station, more than 66,000 volunteers were employed in testing vasicant agents and protective ointments. The Vesicant Study Group, under Dr. William Bloom, Professor of Anatomy in the University, were able to make conclusive tests of the many candidate vesicant agents. One of the outstanding contributions of this group was the demonstration of the inadequacy of the Protective Ointment M1. This led to re-examination of the problem by the Army and Navy and the development of satisfactory ointments. Much credit for the success of the vesicant program is due Lt. Comdr. A. F. Abt, M.D., U.S.N.R., assigned to this laboratory by the Navy. It was largely through his efforts that Navy volunteers became available.

The Toxicity Laboratory's early work was concerned principally with the assessment of vesicant agents and lung irritants. It soon expanded its activities to include all types of toxic agents. This, however, was just a beginning. It quickly became evident that, to assess adequately the potential value of a compound and to know how to guard against its use by the enemy, a host of supplementary information must be known. The stability under field conditions and toward explosives, moisture, oxidizing agents and other things must be known. Was it absorbed through the skin? How volatile? Was it readily detectable or could the enemy be exposed to a lethal dose without knowing? Would it penetrate the enemy's and our own gas mask canisters? Was it a potential water and food contaminant? These were but a few of the problems that confronted the Toxicity Laboratory. To solve them, a hard-hitting group of investigators was brought together—pharmacologists, physiologists, biochemists, pathologists, organic chemists, physical chemists and biophysicists appeared on the roster of personnel.

Following the resignation of Dr. McLean, Dr. R. Keith Cannan, Professor of Chemistry, New York University Medical College, was appointed Director. He held this position until March, 1945, and was succeeded by Dr. William L. Doyle, Associate Professor of Anatomy in the University.

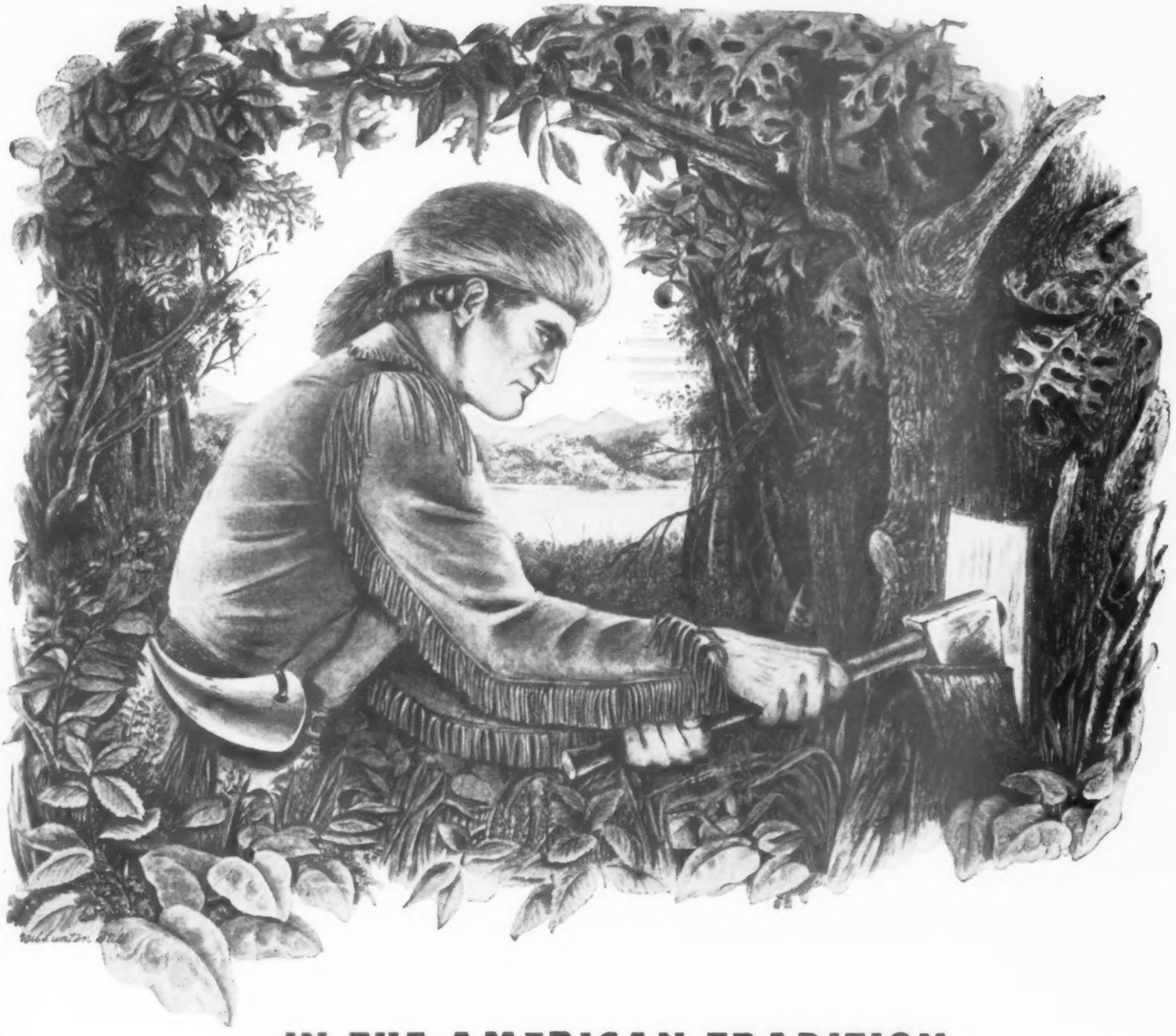
Today, under the guidance of Dr. John O. Hutchens, Director, and Chairman of the Department of Physiology of the University, the University of Chicago Toxicity Laboratory continues to study intensively the many biological, biochemical and biophysical aspects of chemical warfare. An impressive group of the country's most able investigators from every branch of science are associated with the laboratory as consultants and advisers to ensure that its program keeps abreast of all new developments in the biological and physical sciences. Consultation with colleagues in Army and Navy laboratories keeps this civilian laboratory constantly oriented to Service problems. While it was necessary during the war to direct all investigations toward the solution of problems of immediate practical application, the emphasis now is upon basic research for the creation of new knowledge that will lead to new developments both in offense and defense against chemical weapons, and to a better understanding of the underlying principles that govern the behaviour of toxic agents.

The Tox Lab is still the primary agency for preliminary testing of new compounds, but the staff still manages to find time for intensive investigation of the more interesting compounds. Perhaps the most fascinating aspect of the work is that concerned with the mechanism of action of toxic compounds. In what subtle ways do highly toxic materials even in minute quantities so affect the workings of the human body that life is no longer possible? Do they catalyze some unfavorable reaction within the body or possibly inhibit some essential chemical process? The results of investigations along these lines are of the greatest significance, both to war and peace.

Many of the compounds received for testing during the war were non-volatile solids and liquids. It therefore became necessary for the laboratory to examine them in the form of finely dispersed particles. Methods had to be devised for dispersing them and for characterizing the resulting material. It became necessary to know the exact behaviour of particles varying from visible droplets and dusts down to particles so tiny that their behaviour approached that of molecules in the surrounding air. Careful studies were made on the biophysical aspects of this problem by Dr. Herbert D. Landahl, Assistant Professor of Mathematical Biophysics in the University, and his associates. Detailed information was gained on the deposition of particles in the respiratory tract, knowledge that is of great importance in preventive medicine, industrial hygiene, therapeutics and a host of other peacetime applications.

The testing of the nitrogen mustards as agents

(Continued on page 49)



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Ex-Prisoners of War Reunited At Edgewood

Two men, with a total of 7-odd years spent in Japanese prison camps between them, both survivors of Bataan and Corregidor, whose military careers have been strangely interwoven. One, 1st Sgt. Joel Lloyd, former Chemical Instructor at Nichols Field, Manila, P. I., and the other, Maj. Louis T. Lazzarini, CWS, former Far-Eastern Air Force Officer in Manila, P. I., greeted each other at the Chemical Center, Edgewood Arsenal, Maryland, the post to which once again, by coincidence, they both find themselves assigned.

1st Sgt. Lloyd, who enlisted in the Infantry at Ft. Sam Houston, Texas, in 1936 and reenlisted in 1939 in the Air Corps, was transferred to the Chemical Warfare Service in May 1941 while stationed at Nichols Field and became 1st Sergeant of the 7th Chemical Co. Service (Avn.), with Major Lazzarini as Commanding Officer.

Major Lazzarini entered the Service in 1936 at Edgewood Arsenal under the Thomason Act, which provided a year of specialized training for all persons accepted under this Act. In 1940 he was recalled to active duty as a 1st Lieutenant and again stationed at Edgewood Arsenal, where he served in the Production Division and with troops.

On May 8, 1941, when the Major, then a 1st Lieutenant, arrived in the Philippines, he was met at the dock by a welcoming party, among whom was Sgt. Lloyd. Little did either realize how closely their paths would be drawn together!

In the Philippines, Major Lazzarini was made Far-Eastern Air Force Chemical Officer and Sgt. Lloyd was assigned to his office as Chief Clerk. Both continued to function in these roles up to the outbreak of the war.

When the American forces went to Bataan, which started the renowned Bataan Defense, Major Lazzarini organized from widely separated Chemical Units a company capable of Infantry duty. In this, he was helped immeasurably by Sgt. Lloyd. At this point Major Lazzarini promoted Sgt. Lloyd to 1st Sergeant.

Soon after, his Unit was sent to the front lines as part of the 31st Infantry, where the Unit stayed up to the end of hostilities in Bataan and served with distinction, receiving three Presidential Unit Citations and five battle stars, at which time the entire Unit became prisoners of war.

Here the Major and the Sergeant were separated. Sgt. Lloyd was sent to the dreaded Camp O'Donnell after making the Bataan Death March. Major Lazzarini was sent to Nasibu, Batangas, where the initial treatment was a nightmare.

It wasn't until months later, when the Japs decided to send all prisoners, well or otherwise, to Cabanatuan that Major Lazzarini was able to contact Sgt. Lloyd, who was discovered starved and almost without clothes, practically at death's door, having lost 85 pounds.

"Every day, or whenever possible," stated Sgt. Lloyd, "the Major personally brought and shared with me his food and clothing. It was a rare treat to have someone take such an interest, when I was so run down with malaria. I hon-

(Continued on page 47)

Major Lazzarini and 1st Sgt. Lloyd, now members of the Chemical Warfare Association, receive their membership cards from Colonel Harry W. Spraker, President of the Edgewood Arsenal Chapter.

One of a series describing Cyanamid's many activities.

"You'll see me on the job all winter!"

KEEPING ON THE JOB all winter means keeping well in spite of the threat of "flu" that is predicted for this year.

Influenza viruses cause this disease, and two distinct types have been identified. Evidence also indicates that these two viruses occur in more or less definite cycles: Type A every two or three years; Type B about every four years. Research has developed a vaccine highly protective against both types. Lederle Laboratories Division of American Cyanamid Company, which did much of the development work, has been producing this INFLUENZA VIRUS VACCINE for the Army and physicians' use for many months. In fact, this new vaccine proved so effective in reducing the incidence of influenza that the Army decided to vaccinate ten million soldiers last year.

The periodic recurrence of the Type A influenza virus normally would be expected in this winter of 1946-47. But now, thanks to the development of INFLUENZA VIRUS VACCINE, a new weapon is available to assist the physician in preventing this disease.

The development of INFLUENZA VIRUS VACCINE *Lederle*, is another example of Cyanamid's service to the medical profession and to the public through its research and development work in the field of medicine.

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MOLDING THE FUTURE THROUGH CHEMISTRY

Chemical Corps Joins Cancer Crusade

By COL. JOHN R. WOOD
Chief, Medical Division, Chemical Corps

The Chemical Corps of the Army has just released information of its plans to take part in the national cancer program. Its unique medical research facilities at Edgewood Arsenal, Maryland, will be used to test a wide variety of chemicals in a search for new compounds for the treatment of cancer.

The Chemical Corps will have access to a great many potent and unusual types of chemicals, and its Medical Division is well organized and equipped to make biological studies of these compounds. Much of the research will be accomplished in the normal course of business, in examining these chemicals as possible chemical warfare agents. The additional work required is chiefly the checking of the compounds on mice with cancer. About 50 to 75 mice, specially reared at Edgewood Arsenal, will be used to test each new chemical.

The research will be conducted in close collaboration with leading cancer research groups. A joint committee of research personnel of the Medical Division of the Chemical Corps, the Memorial Hospital for Cancer and Allied Diseases, and the new Kettering-Sloan Institute (New York City) has been set up and will coordinate the chemical testing work of the three institutions. A number of the members of the staffs of the latter institutions were engaged in chemical warfare research during the war, and several worked with the Medical Division at Edgewood. The broad attack on cancer problems will be coordinated through the National Research Council Committee on Growth. Through this committee the Medical Division will integrate its part of the Program with those of the American Cancer Foundation, the National Cancer Institute and with the universities and hospitals engaged in cancer research under the sponsorship of the Committee.

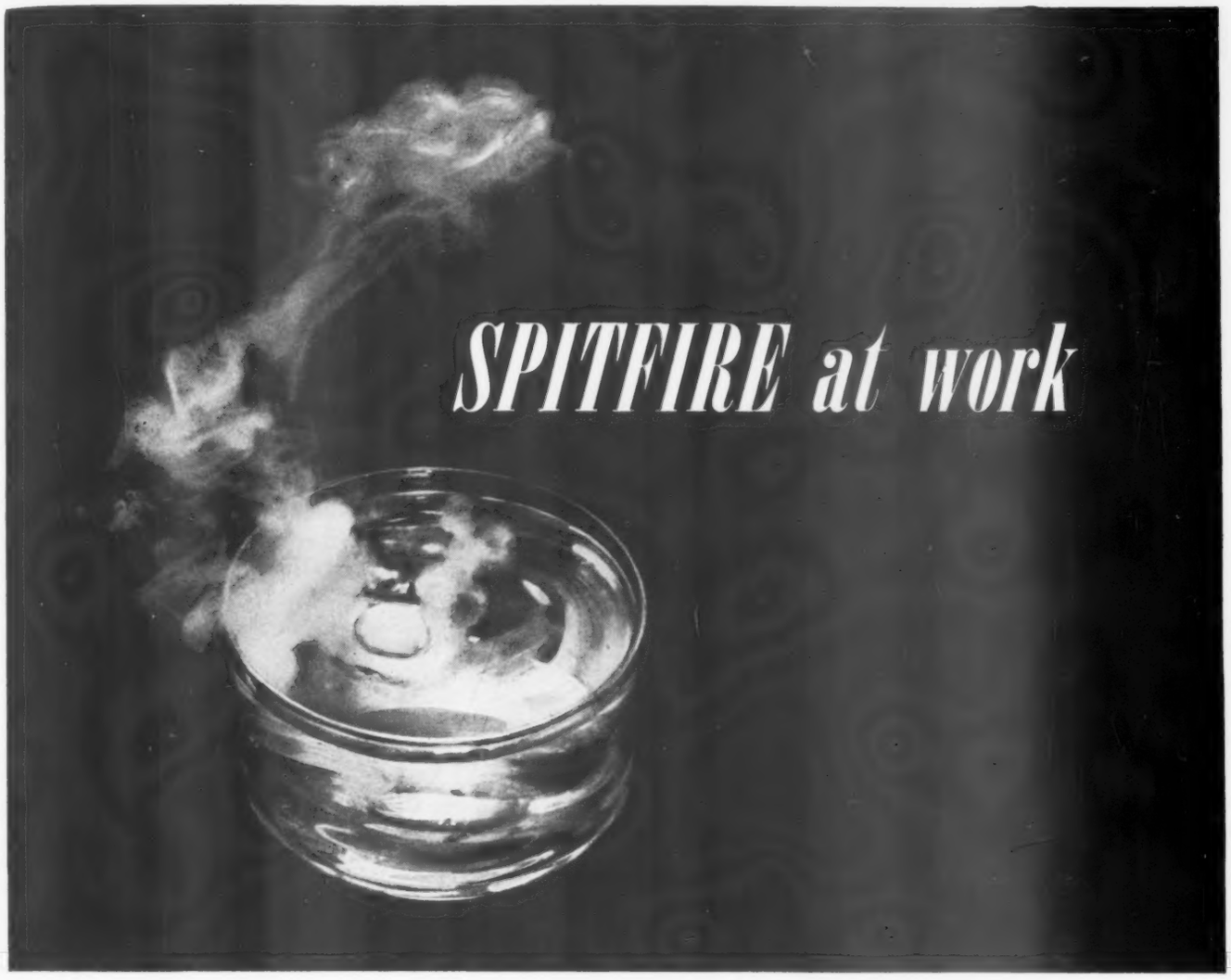
One promising lead has already emerged from chemical warfare research. Following the fall of France, information of new blister gases known to the French and Germans reached this country. They were called "nitrogen mustards" because they blister the skin like mustard gas but contain nitrogen instead of sulphur. An intensive study of these chemicals by the Chemical Corps and the agencies of the Office of Scientific Research and Development led to early recognition that

COL. JOHN R. WOOD

they were very unusual compounds. They were poisonous to nearly all parts of the body, but they were particularly destructive to bone marrow and lymph glands. The bone marrow is the site where most of the blood cells are formed, both white cells and red cells. Another type of white blood cells, and lymphocytes, are formed in the lymph glands. This suggested the possible use of the nitrogen mustards to treat diseases in which there is a great overproduction of white blood cells—the leukemias—or a great overgrowth of lymph glands—Hodgkin's disease and lymphosarcoma. These are all fatal forms of cancer.

Because the nitrogen mustards were very toxic substances, they had to be carefully tested before they could be safely given to human patients. The first trials in patients, made at New Haven, Conn., by Drs. Louis Goodman and Alfred Z. Gilman, proved promising enough to warrant further trials in other cases. The chemicals were made available by the O.S.R.D. and the Chemical Corps to a few selected clinics, which had been informed of the dangers involved. The results in the first 67 cases treated with nitrogen mustards have recently been announced in the Journal of the American Medical Association by Drs. L. S. Goodman, M. M. Wintrobe and M. T. McLennan of the University of Utah School of Medicine; Dr. William Damesheck of Tufts College Medical School; Dr. M. J. Goodman of the University of Oregon Medical School, and Major Alfred Gilman of the Medical Division, Chemical Corps, Edgewood Arsenal. It is clear from the

(Continued on page 51)



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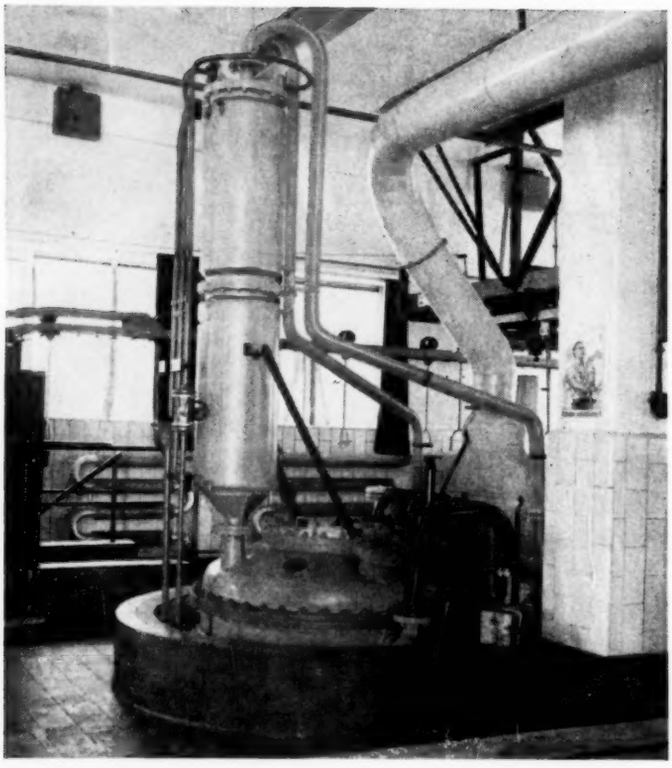
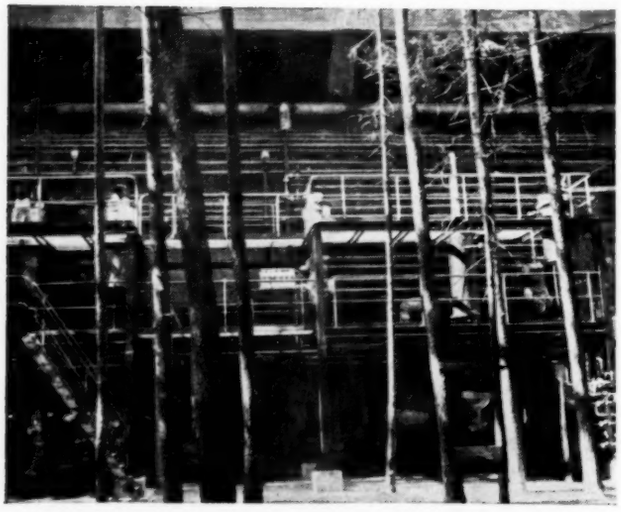


Reaction Kettle and Condensor showing excellent materials of construction. This equipment was built in 1944.

The Chemical Corps Journal presents a first hand discussion of Reppe Chemistry by Dr. M. H. Bigelow, who spent a number of months in Germany interviewing Dr. Reppe. Pictures on this page indicate equipment used in the Reppe Process.

(See story on page 6)



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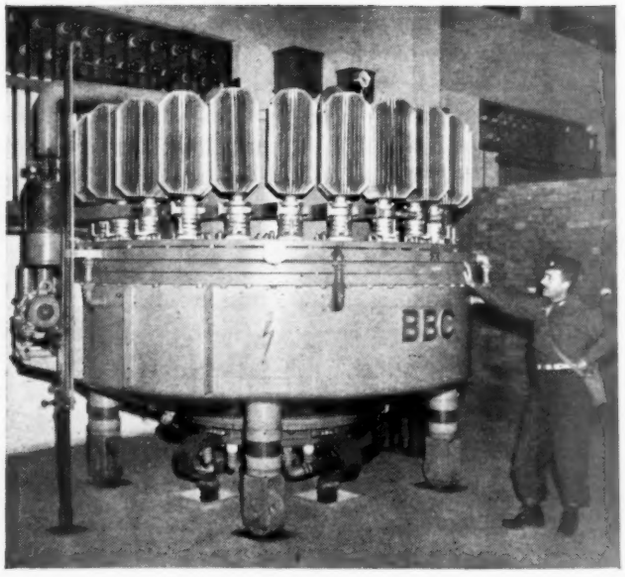

Brown Boveri Mercury Arc Rectifers, 8000 Amps. 6000 Volts. Used in manufacture of chlorine.

CAPTIONS

MORE NATIONAL OFFICERS

Theodore H. (Ted) Marshall, Colonel, Cml. Res., Vice President, Research and Development Committee, formerly deputy to the Commanding General and Executive Officer, Technical Command at Edgewood Arsenal, recently became Manager of Manufacturing, Lederle Laboratories, Division of American Cyanamid Co. at Pearl River, N. Y.

Anthony E. (Tony) D'Angelo, Colonel, Cml. Res., as Vice President, Membership Committee, tops an interesting career in Chemical Warfare since 1927. Called to active duty in 1941, Tony served as Executive Officer, Inspection Division and as Chief, Management Planning Branch, Control Division, OCCC. He is now serving as Deputy Director and Chief Liaison and Contract Branch, Product Research Division, War Assets Administration.

Group assembled at dedication of memorial ceremonies at the Army Chemical Center at Edgewood Arsenal. Left to right: Brig. Gen. E. F. Bullene, Commanding General of the Army Chemical Center; Col. Harry W. Spraker, Executive Officer of the Army Chemical Center; W. Edward Cromwell, an employee of Production Division, who placed wreath on memorial; and George W. Scaggs, President of Employees Welfare Association.

Willard H. Dow, Dow Chemical Co. (left), receives medal from Frank J. Curtis of Monsanto Chem. Co.

(See story on page 8)

The Chemicals Crack Jap Resistance

By CAPTAIN JOHN F. CARROLL, *Cml. Res.*
Associate Editor, The Journal

IN the early days of 42, the Japs experienced the efforts of a gallant group of Chemics who utilized their limited resources to produce effective smoke munitions at Bataan and Corregidor. But they were to learn a new concept of Chemical Warfare Service operations during the ensuing three-year drive which caused more destruction to their war industries and homeland than even did the atomic bomb.

The technical devices developed by the Chemical Warfare Service and operated by their own troops, as well as other branches, found the soft spots in the relatively tough Jap armor. CWS incendiaries decimated his war reserves by reducing his war plants to ashes. CWS tank-mounted and portable flame throwers roasted him out of his fortified foxholes, and then CWS 4.2 mortars firing white phosphorus and high explosives weakened his will to carry on.

To so many people accustomed to look on the wearers of the crossed retorts as "gasmen," it may come as a surprise to learn that stretched from Australia to Okinawa was every type of Chemical Warfare Service unit. There were Mortar Battalions, Laboratory and Smoke Generator Companies, Decontaminating, Processing, Depot and Air Operations Companies. And for the first time in recent history, Floating Detachments of 4.2 Mortarmen, who fired their "Goon Guns" from the decks of LCIs and speedy motor craft in support of landing operations. The mortars put smoke and HE shells in areas the big naval guns could not hit.

Hidden behind the wraps of wartime "security" and hampered by the vast distance involved before a story reached the States, is the combat record established by such CWS Mortar Battalions as the 82nd, 85th, 88th and 98th.

The completely burned shell of the former Manila Post Office (building on the right of the picture) and the other wreckage in the vicinity attests to he accuracy and efficiency of the Chemics who were given orders to "Clear Out the Japs" from this sector of Manila just across the Pasig River.

JOHN F. CARROLL
Capt., Cml. Res.
Associate Editor,
The Journal

Capt. John F. Carroll, a graduate of St. Peter's College and Georgetown University, is currently associated with the Crowell-Collier Publishing Co. in the capacity of Director, International Publications Division. A member of the 7th Regiment, New York State Guard, he began his Army service as an M.P. in July 1942, was commissioned a Second Lieutenont in CWS upon completing OCS at Edgewood in March 1943. He acted as PRO and General's Aide at Camp Sibert, Alabama, and was later transferred to the Pentagon, where he served for more than a year in the News Division of the Bureau of Public Relations. He was flown overseas in July 1945 and acted as PRO at Kunming and later Shanghai, returning to the States in May 1946.

The 82nd fired their first mortars on New Georgia, slogged through the steaming jungles of Bougainville, dragged their carts across the rice paddies of Luzon and practically burned out their guns during the Battle of Manila. While Biak, Hollandia, Tanamerah Bay, Leyte, Okinawa and Breakneck Ridge felt the impact of 4.2 shells from the other battalions. For example, during 141 days of continuous combat on Luzon, the 98th Chemical Mortar Battalion established a record of firing 106,000 25-pound rounds of high explosive and phosphorus. They frequently had to inch their mortars and ammo over knife-like ridges, fight in rags for 2 months without rest or a change of clothing as they fired, what often was, the only artillery support for the armored units.

During the operations along Skyline Ridge, the mortars could be reached by a sheer, narrow trail that was difficult to negotiate ordinarily and hazardous when wet. Traffic was entirely one-way and the passing of pack trains was accomplished only at widened switch-backs or embankment recesses.

Although the gun positions were only 800 yards northeast from the trail, there was a difference in elevation of a thousand feet between the two points and an hour was required to make the trip. Artillery and mechanized equipment were out. But the mobility of the mortar made

it the most important single ground weapon available.

The following typical incident is one which probably will not appear in the official account of the seige of Manila.

Crouched behind a mound of rocks, his OP, on the north bank of the Pasig River, Lt. Leon E. Rubin of Winthrop, Mass., looked across the Jap-held southern half of Manila and said to Sgt. Peet of St. Paul, Minn.: "Well, just put down that beautiful Manila General Post Office as your new APO." "It's a grand building and it would be a shame to ruin it," agreed Sgt. Peet.

The men of the 82nd were awaiting orders for a fire mission from the Infantry Battalion Commander since noon. It was now 1600 and the withering stream of small arms fire continued to pour out of the white Post Office Building.

Finally the order arrived, "Chase out the Japs." "Guess Mac must have changed his mind about the architecture," commented the Sergeant as the first WP shells got underway. A direct hit on attempting to beat out the flames with their rice sleeping mats, the fire-command was for HE.

Alternating rounds of WP and HE on the building and surrounding area scattered the fires and prevented the escape of any of the occupants. Within a short time the beautiful building was an inferno, while a series of explosions rocked it to its foundation as probing 4.2 shells discovered additional ammo dumps.

"Well, Lieutenant," said Peet, "that's one for your book. Today is February 6th, and the 82nd fired the first 4.2 mortars in Manila."

"Right, Sergeant," replied the Lieutenant, as he dolefully looked at what he thought would be the new APO for his mail-hungry GIs.

Yet, before the Japs were completely cleared from Manila, C.W. mortarmen had lobbed more than 20,000 shells into their office building hide-outs.

Later driven from the city, the Japs fell back and dug into their Shimbu Line in the Sierra Madre mountains and there, up among the clouds, they awaited the advance of the Sixth Army—but not for long.

High up on the side of verdant Mt. Mataba the Japs had carved out mazes of underground fortifications, caves for big guns and cliffside emplacements for their machine guns and mortars.

Our planes and heavy artillery had worked over the entire area. Yet the fanatical Japs were still throwing heavy stuff, from their cave-hidden big guns, at our armor and infantry. After being checked for four days, the Infantry Commander decided to give the Chemics free rein with the problem. The April day was as hot as any the Philippines ever had. Yet despite the intense tropical heat, Company "B" of the 82nd Chemical Mortar Battalion, firing from rugged mountain positions, believes it broke the world's record for booping out rock-crushing 4.2 shells. They ploughed up the mountainside with WP shells, whose flame and smoke drove the Japs into the open, where they were finished off by either 4.2 HEs or Infantry machine gun fire.

Here is the way soft-spoken Capt. Joseph Van Yush of Lansford, Pa., 26-year-old veteran of the Munda and Bougainville campaigns, told the story. "It was an eight gun shoot, as we were in support of the 63rd Infantry in the attack on hills A, B and X of the Shimba. The Japs had heavy counter-battery on us—some of my men were wounded. Despite the fact that their 150 mm mortar was more than 700 pounds heavier than ours and threw a 50-pound shell, they didn't deter us very much. Besides, my men were experts. They performed a herculean task of firing 6,000 25-pound rounds from eight guns in one day. This meant an average of 600 rounds per hour. As the battle raged, one gun fired 31 rounds a minute—a 25-pound shell in and out of the barrel each two seconds!"

Sgt. John Wagener of Indiana, Pa., whose gun fired 812 rounds that day, said: "If you have never been present when mass mortars are firing, you just have no idea of the punishing effect it has on the crews. To make matters worse, we caught every reverberation in the ravine. That night all the men were pretty shaky and practically had to converse in sign language, but that solid wall of smoke and fire we maintained was about the most permanent ever seen in the Pacific, to say nothing of how permanent the Japs on the other side of it were. Talk about work! George Pettit, my 125-pound gunner from Fort Laun, S. C., picked up single-handed and dropped down the muzzle of our mortar more than ten tons of ammo that day. From dawn to dusk that day we expended more than 300 2½-ton truckloads of 4.2 shells."

Frequently the fighting in the Philippines was so close that evacuation of the wounded from the field of battle was extremely difficult. Furthermore, the Japs considered litter bearers and the medics as targets of opportunity and fired at them on every occasion. With most infantry outfits it become S.O.P., when it was necessary to remove the wounded from the front lines, to have the Chemics lay down a protective wall of smoke behind the Medics as they carried the wounded to the rear.

Sea-Going "Goons"

Prior to the invasion of Palaus, it had been the policy to suspend naval and plane attacks, for fear of hitting the landing troops. This fact deprived them of desperately needed water-level supporting fire. This statement is amply borne out by a study of the newsreel shots of the early landings. After some experiments, it was proved at Palaus that the amphibious 4.2 mortar was one answer to the prayer of the landing barge passengers. The first results were so successful that the "Floating Mortarmen" were earmarked for broader roles in the subsequent invasions.

At first it was planned to equip LCVPs and LCTs with 4.2 mortars. However, it was soon realized that this type of landing craft could mount but one mortar each and the size of the craft also mitigated against the effectiveness of this rifled muzzle-loading weapon. Consequently, this initial project was abandoned in favor of larger craft which would give added stability and more accurate firepower.

It was also learned quickly that these trailer-mounted or soil-emplaced mortars would need base-plate modifications. The new deck mount developed for the purpose consisted of a large wooden box reinforced with steel. The box was filled with a mixture of sawdust and sand on which rides a wooden sub-base assembly, which in turn supports the mortar base-plate. The entire unit is then lashed to the deck.

On 17 September 1944, at Angaur, the topside Chemics fired more than 2,500 HE rounds in support of the initial landing. The next day, as the Japs infiltrated back to previous sniper positions, they tossed out another 200 rounds as three bursts, which quickly liquidated the opposition.

At Leyte, one group of LCI (M)s accompanied by rocket ships led in the first wave of assault troops, pretty much like a blocking back in a football game, punching holes for the ball carrier. These mortar boats laid down such a concentration, more than 1,200 rounds, that the landing troops failed to find a single live Jap in the first 500 yards. This did not mean that they had withdrawn, for plenty of them were discovered heaped up in the trenches, victims of concussion. After the landing, one flotilla commander radioed the mortarmen, "*You were superlative. Mere words cannot express my commendation.*"

The natural versatility of these deck-mounted chemical mortars was again displayed at Lingayen and Okinawa. As the LCIs approached to within 2,000 yards, the seagoing C.W. men, by varying the powder rings as the ships approached to within 300 yards, were able to work over the entire landing beach area. Then they began to cut off enemy armor and reinforcements by systematically walking their deck-mounted fire inland with rolling barrages to distances of four thousand yards. To quote the naval observer: "They are excellent artillery ships for firing into ravines and gullies which cannot be reached by other naval gunfire support ships and their usefulness continues long after the initial assault."

Much credit for the development of this seagoing mortar is due to Colonel George F. Unmacht and other CWS officers in the Pacific Ocean area, who had been experimenting for several years with the adaptation of this powerful Ground Force weapon to naval uses.

Not only did the Chemics with their 4.2 mortar win the appreciative thanks of the Infantrymen and tankers in the Philippines, as they dragged their mortars into almost inaccessible places to supply them with heavy supporting fire, but the Chemics were also their own best salesmen. The acceptance given to the 4.2 mortar ranged all the way from a skeptical Infantry commander who picked up a field phone and asked a young CWS officer to demonstrate the accuracy of the rifle-barrel mortar, to Commanding Generals in the five theaters who asked for more and more 4.2 mortars and trained Chemical Warfare Service officers to supervise their firing. For it was not without cause that the Nazis referred to the 4.2 mortar as "Whispering Death," while the Nips called it the "Automatic Cannon."

Dr. Dow

(Continued from page 8)

of salt or their diverse compounds are vital to the petroleum, lumber, automobile, and textile industries. They go into hundreds of medicinal compounds, fumigants, and insecticides to protect our health and our food, as well as being key factors in water purification and sewage treatment. They hold a dominant position in the making of rayon and practically all plastics, dry cleaning fluids, refrigeration media, and fire extinguishers. They are so much a part of us that we can scarcely touch an object that has not in some way been benefited by the chemistry of salt and, thus, is indebted to direct current electricity, which in turn was contingent upon the steam engine."

Dr. Dow concluded, "Nature offers the opportunity to advance. Our civilization is enlightened chemically, physically, and mechanically, but not spiritually. Is it not high time to forsake false issues and return to fundamental thinking—fundamentals that make for a full life, liberty, and the pursuit of happiness?"

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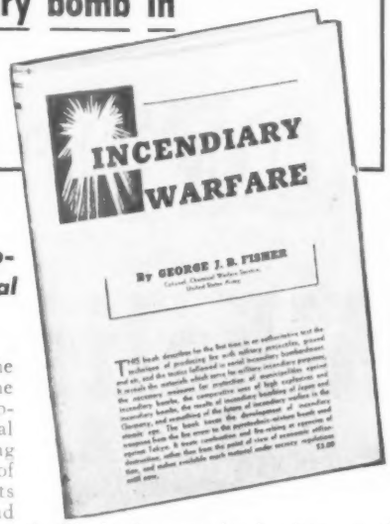

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Colonel, Chemical Warfare Service, United States Army

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Col. George J. B. Fisher, author of the book, "Incendiary Warfare," was born 27 June 1893 in New Jersey, is an officer who came up from the ranks, and has contributed articles to various military publications for the past 20 years. His book on incendiaries should be of considerable interest to most of the soldiers who had anything to do with the development, procurement, training and actual handling of the bombs in the various theaters. Industry, which produced these important missiles, will be interested as Col. Fisher has presented the story of the incendiaries in a simple but clear manner. "Incendiary Warfare" is an extra added attraction for your library. Members of the Chemical Warfare Association will receive a special discount if interested in the purchase of the book. Mail orders to National Headquarters, Chemical Warfare Association, 2153 Florida Ave. N.W., Washington 8, D. C.

Col. Fisher was Chief, Civilian Protection Branch, OCCC; Chief, Training Division; Commandant, Western Chemical Warfare School, Rocky Mountain Arsenal; saw service in Germany.

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Prevention of Setting of Slurries

By SOLOMON LOVE and JEROME GOLDENSON

The authors, members of the Chemical Corps Technical Command, Edgewood Arsenal, Maryland, report on the new developments regarding the properties of these materials and the prevention of their setting.

•

THE importance of the problem of setting of bleach-water slurries was recognized in the Chemical Warfare Service only after the procurement of bleaching materials in large quantities in connection with the war, and the increased use of slurries in power-driven decontaminating apparatus. The work herein reported was initiated when it appeared that a large amount of "setting" bleach was being received which would cause serious difficulties if used in decontaminating apparatus (modified orchard sprayers used for spraying bleach slurry over areas contaminated with toxic war gases) during cool or cold weather. It was the purpose of this study to investigate the conditions under which bleach-water slurries set and to determine how setting may be prevented.

O'Connor observed in 1927 that when large amounts of calcium hydroxide were added to a 15% solution of calcium hypochlorite at 0° C., the mixture set to a semi-rigid mass (13). Reitz and Ehlers found that the addition of large quantities of calcium hydroxide to solutions containing calcium hypochlorite and calcium chloride at temperatures under 40° C. resulted in the formation of "cohesive masses" (16). It was stated that the solidification was due to the presence of calcium oxychloride in the precipitate. Work by Ourisson (15) indicated that the formula of the oxychloride might be $CaCl_2.3Ca(OH)_2.13H_2O$.

In unpublished work at Edgewood Arsenal in 1936, it was found that bleach slurry containing about 10 to 11% available chlorine, produced by chlorinating a mixture of calcium hydroxide and water, solidified on standing several days because of "underchlorination and the low temperature of storage (15° C.)." Somewhat later, during inspection tests of power-driven contaminating apparatus at Edgewood Arsenal, several cases of setting of 50:50 slurries of bleaching powder and water were encountered.

Composition of Bleaching Powder

It has been noted that the physical properties of bleaching powder, e.g., the lack of marked deliquescence, are not those that would be expected of a simple mixture consisting essentially of calcium hypochlorite, calcium chloride, and calcium hydroxide. Principally to explain the lack of marked deliquescence, Odling (14) suggested the existence of a chlorohypochlorite $Ca(OCl)Cl$. Kraut (8) proposed a double salt $CaCl_2.Ca(OCl)_2$, while Neumann and Haebler (11) favored a basic chlorohypochlorite structure $3Ca(OCl)Cl.Ca(OH)_2$. O'Connor (13), studying the system calcium chloride-calcium hypochlorite-calcium hydroxide-water, found no evidence of a double salt of calcium chloride and calcium hypochlorite. Bunn, Clark, and Clifford (4) in 1935 reviewed critically the literature on the composition of bleaching powder, and showed by x-ray, phase rule, and microscopic studies that ordinary bleach consists essentially of calcium hypochlorite and a basic chloride $CaCl_2.Ca(OH)_2.H_2O$. Thus, it is no longer necessary to assume the presence of a chlorohypochlorite such as $Ca(OCl)Cl$ (Odling) in order to explain the lack of marked deliquescence of bleaching powder. Brady (3) gave a short, concise review of work on the constitution of bleaching powder, emphasizing the contribution of Bunn, Clark, and Clifford.

Terminology

Bleach—This term is used broadly in this report to include: ordinary and stabilized bleaching powders, high test calcium hypochlorites (6, 7, 9) and special products of a similar nature. See Table 1 for chemical analyses of samples of the various types of bleaching materials.

Stabilized Bleaching Powder—This material, which is also known as "tropical" or "supertropical" bleach, contains about 30% available chlorine. It is characterized by low moisture content, 0 to 3%, and a high percentage of calcium hydroxide. In some cases, free calcium oxide is present.

50:50, 45:55—Such designations indicate the composition of slurries; the first figure in the ratio represents the relative weight of bleach and the second figure represents the weight of water used to make the slurry.

Materials, Equipment and Methods

Bleaching Materials—High test, ordinary, stabilized, and special types. (These materials were not all freshly procured, which accounts for the low available chlorine content in some cases.)

Calcium Hydroxide—Commercial grades.

Substances Tried as Antisetting Agents—Inorganic substances included acids, bases, and salts containing common anions and cations. Organic substances included gums, setting agents, acids, and alcohols.

Determination of Set Point—The slurries were prepared by adding 20 grams of bleach, gradually with stirring, over a period of two minutes to the required amount of distilled water in a 150-ml. beaker. Stirring was continued for another 5 minutes to insure as uniform a slurry as practicable. The slurry was then cooled in an ice-water or dry ice-acetone bath at the rate of about 2° C. per minute, with constant stirring. Usually at a temperature several degrees above the set point, the slurry became thick, but the actual set point was taken as the temperature at which the beaker could be inverted in the air for one minute without loss of the contents.

Methods of Analysis—The methods used for determining available chlorine, calcium chlorate, and calcium chloride were essentially those given in Scott's Standard Methods of Chemical Analysis, 5th Edition, page 2159. Calcium hypochlorite was obtained by calculation from the available chlorine results. For sodium chloride it was necessary to run a total calcium determination by the standard oxalate method in addition to the analyses indicated above and make suitable calculations.

The methods for determining calcium hydroxide, calcium carbonate, and water are described in U. S. Army Specification 97-54-281, July 19, 1945, Bleaching Material (For Decontamination).

Insolubles in acid were determined by heating bleach with dilute hydrochloric acid and filtering. Sulphates were determined by adding barium chloride to the filtrate.

Nature and Causes of Setting

The causes of setting are presumably complex. No complete investigation of this subject was attempted, but a brief study was made with the thought that some knowledge of the causes might suggest the remedy.

High Test Bleach—Of nine high test samples, six set when the bleach was added to an equal weight of water at room temperature (Table 1). The use of slightly more than 50% water (slurry=45:55) prevented setting, indicating that with high test bleach, setting may be due to the hydration of anhydrous or nearly anhydrous calcium hypochlorite.

Special Products—No explanation is offered for the setting characteristics of these special products, but they may be considered in the light of the discussion of the setting of ordinary and high test bleach slurries.

Ordinary and Stabilized Bleach—When cooled, slurries consisting of equal parts by weight of ordinary or stabilized bleaching powder set quite sharply (usually within 1° C.) to pasty or gelatinous masses. The change was reversible, the mass gradually returning to the fluid condition on warming. Usually the reversion to the fluid state was completed within a range of about 5 to 10° C. above the set point.

TABLE 1

Chemical Analyses[f] of Bleaching Powders and Calcium Hypochlorites Set Points of the Water Slurries[a]

Sample[b]	$Ca(OCl)_2$ %	$CaCl_2$ %	NaCl %	$Ca(OH)_2$ %	H_2O %	Excess $Ca(OH)_2$, %[c]	Set Point °C.
OR1	30.0	25.5	0.0	24.6	8.8	+ 7.6	+18
2	35.2	30.2	0.0	6.0	19.1	—14.1	—38
3	25.3	32.9	0.0	28.2	7.4	+ 6.3	+17
4	23.8	33.6	0.0	10.1	12.0	—12.3	— 5
5	38.2	30.9	0.0	2.9	14.3	—17.7	—44
6	11.8	39.6	0.0	16.0	17.9	—10.4	< + 4
7	34.1	28.0	0.0	14.0	13.5	— 4.6	—32
8	31.3	33.1	0.0	24.0	6.4	+ 2.0	—20
9	28.6	34.3	0.0	24.0	6.5	+ 1.2	—10
10	30.5	27.9	0.0	31.8	3.7	+13.2	+19
11	34.4	29.2	0.0	24.5	4.3	+ 5.1	— 7
12	36.2	31.8	0.0	17.9	4.9	— 3.3	—33
13	31.2	28.3	0.0	25.3	4.3	+ 6.5	+19
14	35.3	29.1	0.0	17.4	3.1	— 2.0	—26
15	31.5	26.8	0.0	23.7	8.5	+ 5.8	— 5
ST1	31.1	27.3	0.0	33.0	2.8	+14.8	+28
2	32.1	32.2	0.0	29.5	2.5	+ 8.0	+13
3	31.4	28.4	0.0	30.2	0.0	+11.3	+23
HT1	72.8	4.6	11.3	3.9	2.5	+ 0.8	S
2	74.1	3.0	14.3	1.4	1.2	— 0.6	S
3[d]	74.1	3.2	13.8	1.1	1.6	— 1.0	S
4[e]	70.9	8.7	9.3	0.7	1.6	— 5.1	—22
5	52.1	15.0	0.0	5.6	8.5	— 4.4	S
6	64.5	8.1	0.0	3.1	8.5	— 2.3	+ 4
7	56.0	19.3	0.0	11.7	0.5	— 1.1	S
8	67.9	12.2	0.0	13.9	5.2	+ 5.8	< + 4
9	72.6	8.5	0.0	11.3	0.0	+ 5.6	S
SP1	38.6	4.6	47.7	0.9	0.0	— 2.2	S
2[e]	46.9	5.2	0.0	38.1	0.0	+34.6	+ 4

[a]Equal parts by weight of bleaching materials and water.

[b]OR=ordinary, ST=stabilized, HT=high test, and SP=special bleach.

[c]Excess or deficiency of calcium hydroxide in relation to the amount required to unite with calcium chloride to form $CaCl_2.Ca(OH)_2.H_2O$.

[d]Similar to HT2; an indication of the reproducibility of the analytical results may be obtained by comparing the results with HT2 and HT3.

[e]These materials were granular in nature; the remainder were powdered.

[f]The calcium carbonate contents ranged between 3 and 6% in most cases, but for OR4 and OR5 they were 11.5 and 7.7%, respectively.

The calcium chlorate contents in most cases were about 1% or less. For the following materials, the calcium chlorate contents were in the range 3.1 to 8.3%: HT5, HT6, HT7, OR4, and OR6.

The calcium sulfate contents in most cases were about 0.5% or less.

"S" indicates that the slurry set on mixing; the temperature was usually about 40 to 45° C. immediately after mixing (room temperature 25 to 30° C.).

< +4° C. indicates that setting did not take place during 15 minutes at 4° C. or less in an ice-water bath.

Of 15 ordinary bleaches made into 50:50 slurries, 4 set above 0° C. and 7 set above —10° C. (Table 1). All three of the stabilized bleaches tested set at relatively high temperatures (13 to 28° C.). Slurries setting above 0° C. would be particularly apt to give trouble in the power-driven decontaminating apparatus if used in cool or cold weather. Setting at temperatures above freezing occurred with some ordinary and stabilized bleaches even when the slurry contained as much as four parts of water for each part of bleach.

With ordinary bleach, the manner of preparing the slurry had no significant effect on the setting properties. For example, bleach was added to water in some cases and water was added to bleach in others, and the rate of addition of one component to the other and the type and time of agitation were varied, without changing the set point appreciably. The results of sieving various bleaches varied widely and there was no evident correlation between set point and the percentage passing through a No. 30 U. S. standard sieve. There was no apparent correlation between pH (17) and set point, the pH's of 50:50 slurries usually being in the range 10.06 to 10.81.

The results shown in Table 1 indicate that with ordinary bleaching powders and stabilized products, setting was connected with high calcium hydroxide content. Bunn, Clark, and Clifford (4) state that "the strength of its spectrum indicates that it ($CaCl_2.Ca(OH)_2.H_2O$) must account for all or most of the residual calcium hydroxide in ordinary bleaching powder." This suggests that setting may be connected not only with the presence of calcium hydroxide, but with calcium chloride as well. Assuming that the calcium chloride shown in the analyses is combined with calcium hydroxide to form the complex mentioned above, there will be an excess of calcium hydroxide in some cases and a deficiency in others. The excess or deficiency is shown in Table 1. It will be noted that on this basis ordinary or stabilized bleaches giving slurries which set above 0° C. had an excess of calcium hydroxide of approximately 6% or greater.

Confirmation of the fact that setting with ordinary and stabilized bleaching powders is related to high calcium hydroxide content, in the presence of calcium chloride, was obtained as follows:

1. Slurries composed of equal parts of ordinary bleaching powder and water that did not set at ordinary temperatures were found to set when 10% or more calcium hydroxide (purity 78%) was added to the bleach. Taking into consideration the purity of the calcium hydroxide added, the mixture with 10% added calcium hydroxide contained 9.6% calcium hydroxide in excess of the amount required to form the basic chloride, $CaCl_2.Ca(OH)_2.H_2O$; the 50:50 slurry set at 6° C. A mixture with 5% added calcium hydroxide contained 5.8% excess calcium hydroxide; the 50:50 slurry did not set in an ice bath at 4° C.

2. High test bleach slurries, mixed with somewhat more than an equal weight of water, did not set in an ice bath, alone or mixed with added calcium hydroxide. However, the slurry set on cooling when both calcium hydroxide and calcium chloride were added, indicating that the presence of both of these materials was necessary to obtain setting. This setting should not be confused with the type of setting that takes place on mixing equal parts by weight of high test bleach and water, which is thought to be due to hydration of the hypochlorite. As noted above, the literature indicates that no complex containing calcium chloride and calcium hypochlorite forms under ordinary conditions. It appears, therefore, that the calcium chloride and the calcium hydroxide must react to form a complex which is responsible for setting.

3. Water slurries of mixtures of calcium hydroxide and calcium chloride set at ordinary temperatures when calcium hydroxide was present in excess of the amount required to form the basic chloride, $CaCl_2.Ca(OH)_2.H_2O$.

Slurry containing 5 grams of calcium hydroxide and 10 grams of calcium chloride did not set in an ice bath, while with 8 grams of calcium hydroxide and 10 grams of calcium chloride the slurry set at 27° C. Allowing for the purity of the added calcium hydroxide (92%), the excess calcium hydroxide in the latter mixture over the amount required to form $CaCl_2.Ca(OH)_2.H_2O$ was about 10%. Calcium hydroxide alone when mixed with an equal weight of water did not set in an ice bath.

In his work with the quaternary system $Ca(OCl)_2$-$CaCl_2$-$Ca(OH)_2$-H_2O, Ourisson (15) has shown the existence between 10° and 40° C. of varying proportions of the following compounds: $3Ca(OCl)_2.2Ca(OH)_2.2H_2O$ (I), $Ca(OCl)_2.2Ca(OH)_2$ (II), $CaCl_2.3Ca(OH)_2.13H_2O$ (III), and $CaCl_2.Ca(OH)_2.H_2O$ (IV) (see also ref. 10). He also reported the presence of $Ca(OCl)_2.3H_2O$, $Ca(OH)_2$, $CaCl_2.4H_2O$, and $CaCl_2.6H_2O$. The formation of compound III, which contains 13 molecules of water, would take up a large amount of water and might cause a slurry to thicken or even solidify. Compound III forms only if the amount of calcium chloride present is relatively high, approximately 12% to

35% or more, and if the temperature is below about 30° to 35° C. Since ordinary bleaching powder contains about 30% calcium chloride, it is believed that compound III may form on cooling the slurry, particularly with samples containing much calcium hydroxide.

Remedies for Setting

Control of Composition—It appears obvious from the discussion above that the setting of bleaching powder slurries would not occur if the composition were controlled closely enough in manufacture to insure that the product would contain calcium hydroxide, calcium chloride, and possibly calcium hypochlorite in certain non-setting proportions. Discussions with manufacturers of bleaching powder, however, indicated that such close control of plant operations would be impracticable. Furthermore, even if a non-setting product could be consistently manufactured, the composition might change sufficiently during storage to convert the bleach to the setting type.

Use of Larger Amounts of Water—It was found that with ordinary and stabilized bleaching powders, changing the bleach to water ratio from 50:50 to 33:67 had little effect on the set point. The use of successively larger amounts of water (ratios up to 14:86), however, gradually lowered the set point. Since slurries containing much more than 50% water do not adhere well to vertical surfaces, a serious defect from the standpoint of decontamination, the dilution of slurries with large quantities of water to prevent setting is considered impractical.

With high test and special products, the use of a small excess of water, e.g., changing the bleach to water ratio from 50:50 to 45:55 or 40:60 prevented setting. Thus, with these materials, setting does not constitute a real problem.

Antisetting Agents—A number of compounds have been found effective, when used in small quantities, in modifying the setting or gelling characteristics of various mixtures. For example, as little as 0.1% aluminum stearate lowers markedly the congealing point of certain petroleum oils (1, 2). Sucrose has been used to retard the setting of Portland cement (5). The work of Hofmeister on the coagulation of negative albumin sols by alkali salts suggests that the setting of bleach to water slurries might be prevented by compounds containing the citrate or tartrate anion (17).

About 100 substances (see list of materials above) were tested for effectiveness as antisetting agents for water slurries of ordinary or stabilized bleaching powder. The composition of the slurries was usually about 50:50, but 45:55 and 40:60 slurries were also tested in some cases. In making these tests, from 0.3% to as high as 10% of the candidate anti-setting agents, based on the weight of bleach, was stirred with the required amount of water in a 150-ml. beaker for a few minutes. Twenty grams of bleach was added gradually with stirring and the set point of the mixture was then determined. From a practical standpoint, only those substances which were effective under the conditions of test were considered suitable candidates.

Of the materials tested as antisets, sucrose (ordinary table sugar) was the best from the standpoint of effectiveness, availability, and cost. In some cases, as little as 0.3%, based on the weight of bleach, prevented setting in an ice bath. Table syrup was about as effective as sucrose, but black molasses was less potent and appeared to react with the bleach. (In this connection see reference 12.) Citric acid was about as effective as sucrose also. Other antisetting substances of considerable merit when used in small amounts (0.3% to 1%) were the following: potassium citrate, tartaric acid, potassium acid tartrate, potassium sodium tartrate, gallic acid, tannic acid, and glucose. Boric acid was effective when used to the extent of 5% of the weight of bleach. Borax retarded setting when used to the extent of 10% of the weight of bleach.

The use of 1% sucrose, based on the weight of bleach, was effective in lowering the set point of 50:50 slurries of stabilized, ordinary, high test, and special types of bleach. Of 13 bleach-water slurries originally having set points above 0° C., the lowering of set point ranged from 10 to 71 centigrade degrees. (Note: For this calculation, the set point of the slurries that "set on mixing" (high test) was assumed to be 25° C.; the actual temperature of the semi-solid mixture was usually about 40 to 45° C. immediately after mixing (room temperature 25° to 30° C.). The average lowering was 43 centigrade degrees and the highest set point in the group (with sugar) was —6° C.

For stabilized bleaches, 0.5% sugar was insufficient to lower the set point of 50:50 slurry below 0° C., while 1% sugar was effective for the purpose. With 40:60 or 45:55 slurries, however, 0.5% sugar was effective in obtaining set points of —9° C. or lower in all cases. The set points of the 40:60 slurries with 0.5% sugar were in most cases about —15° to —20° C., while without sugar the set points ranged up to 26° C.

Summary

A number of samples of commercial bleaching

(Continued on page 50)

The First Chief

By COL. GEORGE J. B. FISHER, *CmlC*

Q. Who was the first Chief of Chemical Warfare?

A. There are two answers to this question. They remind us that this branch of our National Defense has been in existence a respectably long time.

Maj. Gen. W. L. Sibert was appointed Chief of the Chemical Warfare Service on May 11, 1918. As the organization was developed under his direction, Brig. Gen. Amos A. Fries was designated to command the Overseas Division—"overseas" in those days of alphabetical simplification meaning AEF, which was mostly in France.

However, General Fries had actually been appointed much earlier as Chief of the Gas Service of General Pershing's Expeditionary Forces and had been serving as such since September 3, 1917. What General Sibert did was therefore to regularize and officially recognize in Washington a situation that had existed in the theater of operations for nearly eight months.

Need for a unified chemical warfare organization within the War Department had been apparent for some time. Several branches were working more or less independently on problems relating to gas, smoke and incendiaries. Gas defense was a responsibility of the Medical Department. Offensive munitions were produced by Ordnance. Engineers provided chemical combat troops and supervised field training. Alarm devices were Signal Corps items. Research was directed by the Bureau of Mines, which had been pioneering in this field since before our entry into the war.

This divergent approach to a common end produced a situation which nearly equaled chaos. It seems remarkable today that the answer so speedily hit on overseas should have been so tardily accepted in the Z of I. Yet the fact remains that the Chemical Warfare Service officially existed as a technical branch of the War Department for exactly six months before the termination of hostilities in 1918.

Since it was created under the emergency war powers of President Wilson, the new organization was but temporary. The question whether the service should continue as part of the permanent Military Establishment was debated rather heatedly during 1919 while the reorganization of the Army was being studied by Congress. The final decision to maintain an independent chemical warfare agency was embodied into the revision of the National Defense Act of 1916 and became effective 1 July 1920.

The Chief of the new and permanent Chemical Warfare Service was Amos A. Fries. Like Sibert, Fries had been an Engineer Officer. General Fries' initial rank under the new setup was brigadier general; later the job was raised to the two star rank.

So, while General Fries was the first permanent chief and the first to head a unified chemical organization in the field, General Sibert first headed the organization within the War Department which was the forerunner of the Chemical Corps of today. Each of these two distinguished officers contributed largely to the early development of the service.

MANHATTAN PROJECTS AWARDS

Manhattan Project, War Department agency for atomic energy, recently announced the award of a contract to Hydrocarbon Research, Inc., 115 Broadway, New York, N. Y., for architectural and engineering services in connection with the construction of the Brookhaven National Laboratory, Patchogue, Long Island, N. Y.

The new laboratory, one of a chain of government-sponsored and financed atomic research laboratories, will be built on the site of former Camp Upton. The laboratory will be operated under contract by Associated Universities, Inc., a special research agency formed by nine major Eastern universities.

The contract with Hydrocarbon Research, Inc., covers architectural and engineering services, including design, engineering, specifications, inspection and supervision of construction.

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Letters to the Editor

This department provides a forum wherein our readers may present their views on appropriate subjects. Within limits of available space, all contributions will be used if relevant and interesting. Criticism should be constructive, of course. There is no arbitrary limit to length—but brevity is expected. There will normally be no editorial comment or retort to contributions—it is YOUR department.

35 East 84th St.
New York 28, N. Y.

Dear Hal:

Congratulations on the first issue of the *Chemical Corps Journal.* Though I have not had the opportunity to study it carefully, I believe it is eye-pleasing, well made up and clean looking. In short, a quality production.

I am wholeheartedly in favor of the stated policies of the *Journal.* The United States today more than ever in its history needs intelligent and forceful leadership. Through the pages of the *Journal* you can do your part in properly informing our democracy by disseminating the views of the many prominent leaders in military, scientific and industrial circles who are numbered in your readership.

Two things interested me, editorially speaking, in this first issue. One was the flat assumption by several writers advocating military preparedness that we are heading into a new and more terrible world conflict. Do you think we are helping the cause of peace by just assuming that there will be another terrible war? Wouldn't it be better to stress the need for military preparedness on other grounds, such as the common sense realization that defenseless or weakly prepared nations invite the aggressor's blow? So far as I am concerned, I deplore and abhor defeatist thinking on the inevitability of war. Defeatist thinking didn't make America great and it won't keep her great either.

The other point I wish to mention is the *Journal's* handling of its criticism of the Mead Committee. It seemed too blunt and unrestrained to me. Since the *Journal* is closely identified with the CWS, though it is true, as you point out in your statement of policy, that it is not an official publication of the War Department, I wonder if it wouldn't be wise to carefully document any unfavorable criticism the *Journal* makes of powerful government bodies, such as the Mead Committee.

In chiding the committee on its handling of the Garson case with respect to the CWS—which I agree with the *Journal was disgraceful*—I believe one of the most effective approaches you could have used was to reprint Hanson Baldwin's *Sunday Times* article of about a month ago. In the article Baldwin gave what I considered an objective discussion of the pros and cons of the 4.2 mortar and pointed out that a certain number of premature explosions and other similar accidents happen with any gun or mortar of that type.

Hal, I'm a fine guy. I start out by saying that I haven't any suggestions to offer and then spend more than a page telling you how to run your magazine. However, I am sincere when I say I think you're off to a great start. Keep it up and by all means keep the brass hats from running the show.

If at any time you think I could do another article of interest to the *Journal,* I should consider it a privilege to do so.

My best to you and the Schwimers. Hope to hear from you again soon.

Sincerely,

JACK MUNHALL.

P. S.—I certainly do remember Sibert—but in nothing resembling happy nostalgia. Why don't they give that swamp back to the boids?

☆ ★ ☆

57 Tappan Landing Rd.
Tarrytown, N. Y.

Dear Col. Rodier:

May I offer my congratulations on the splendid job you have done with the first issue of the *Chemical Corps Journal.* As you may surmise from some of the details stated below and in the attached documents, I have a personal interest in the Chemical Warfare Association and its official *Journal.*

One of the articles which interested me particularly was the one entitled "CWA Comes Into Being," by Capt. John F. Carroll, Cml. Res. I was especially interested in the portion of that article reading as follows:

"It (the Chemical Warfare Association) didn't just happen, like Topsy, but it appears to have been the result of numerous conversations over coffee cups to the effect that someone should do something about it.

"The first steps towards any definite action

appear to have been taken when Col. Delancy King of the Control Section and James Hinyard came int othe office of the Special Assistant to the Chief, Col. Herbert K. Bear, in the latter part of November 1945 and suggested that someone begin to crystallize now the discussion of many years about the formation of a Chemical Warfare Association."

It may interest you, Capt. Carroll, and your many readers to know that "the first steps towards any definite action" in the establishment of the Chemical Warfare Association actually took place many months prior to November 1945; in fact, it was on April 28, 1945, to be exact, that I submitted to the Army Suggestion Program, through the Chairman of the Local Committee on Suggestions of the New York Chemical Warfare Procurement District, my suggestion entitled "Establishment of Chemical Warfare Association," and it was many months prior to that time that I conceived the idea for the formation of such an association.

As you will note from the attached copies of documents, my suggestion was rejected by OCCWS as "not favorably considered." The same Col. Herbert K. Bear, CWS, mentioned in the excerpt from the *Journal* as one of those involved in the first steps towards any definite action in the formation of the Chemical Warfare Association, was Chairman of the Suggestion Committee, OCCWS, at the time my suggestion for such an association was rejected.

In Col. Bear's article entitled "CWA Objectives" in the same issue of the *Journal*, I note that he states that ". . . a group of officers then on duty at the Office of the Chief met in December 1945 and decided that it was high time that something was done about having an association." I submit that that decision had been made over eight months previously by the undersigned in his suggestion to the Army Suggestion Program, which suggestion was rejected as "not favorably considered" and then adopted in its entirety a few months later by the same office which rejected it.

As Editor of the *Chemical Corps Journal*, one part of my suggestion may be of particular interest to you, which is an excerpt from paragraph 7, reading as follows:

> "As a valuable adjunct to the association, a monthly magazine called 'Chemical Warfare,' or some other suitable name, could be published . . ."

May I also invite your particular attention to the comparison of the purposes of the Chemical Warfare Association as outlined in my suggestion of April 28, 1945, and the same purposes, as outlined in the first issue of the *Journal* and, earlier, in Gen. Waitt's letter of March 1, 1946. A cursory comparison of the two is quite enlightening as to what actually were "the first steps towards any definite action" in the founding of the Chemical Warfare Association.

Yours very truly,

JACK A. DORLAND.

☆ ★ ☆

ARMY SERVICE FORCES
OFFICE OF THE COMMANDING OFFICER

Dear Col. King:

I read with greatest interest the first copy of the *Chemical Corps Journal* and want to express my gratification and pleasure in the splendid manner in which it has been gotten together. This represents the tangible realization of a dream which I and many of the officers of the old CWS have long held. Certainly you and Rodier and Schwimer and all the other people who have contributed are to be congratulated on what is a definite and long-needed adjunct to the National Defense.

Sincerely yours,

GEO. J. B. FISHER
Colonel, CmlC
Commanding

☆ ★ ☆

THE BELL MACHINE COMPANY
OSHKOSH, WIS.

Gentlemen:

Thank you for your letter of October 22nd and the first issue of Chemical Warfare Association's new publication. We have enjoyed reading the various articles in the booklet and wish to commend you on your fine work, as we extend our best wishes for the future success of this magazine.

With kindest regards, we remain

Very truly yours,

E. F. STECK
Sales Engineer

☆ ★ ☆

OXFORD-PRINT
MEDFORD, MASS.

Dear Col. Rodier:

I want to extend congratulations and compliments on the first edition of your *Chemical Corps Journal*. It is filled with readable, informing material. It is a magazine of real merit throughout.

I trust your efforts in the publishing of this *Journal* will be most successful.

Sincerely yours,

HARRY P. PORTER,
President

HEADQUARTERS SAN JOSE PROJECT DIVISION
OFFICE OF THE COMMANDING OFFICER

Dear Col. Rodier:

I have just received my copy of Vol. I, No. 1, *Chemical Corps Journal*, October 1946. It has been read from cover to cover with the greatest interest and my immediate reaction is one of extreme satisfaction for a job well done. You people deserve the greatest of praise.

Your publication is the first magazine which has arrived in this isolated post for an extended period. We hope that your "breaking the strike" is an omen of the future success of the publication. I assure you that it has an unusually great interest for all of us here.

Please give my kindest regards to all my good friends, including Pete King and Joe Schwimer.

Sincerely,

LOWELL A. ELLIOTT
Colonel, CmlC
Commanding

☆ ★ ☆

OFFICE OF THE CHIFE, CHEMICAL WARFARE SERVICE
WASHINGTON, D. C.

Dear Ludlow:

I saw Col. Rodier last week and congratulated him on the very fine first issue of the Association magazine. This is just a line which I should have sent you before to tell you myself how pleased we all are with the magazine, and to congratulate you and the Association. This successful first issue augurs very well for continued success. You have gotten off to a splendid start. I shall be glad to cooperate in every possible way with the Association in maintaining the high standard now set.

Hoping to see you soon in our new offices here in the Pentagon where we have just moved. With best wishes.

Sincerely,

ALDEN H. WAITT
Major General
Chief, Chemical Corps

Cyanamid Acquires Canadian Plant

American Cyanamid Company announces that its Canadian subsidiary, North American Cyanamid Limited, has concluded an agreement with the Canadian Government to acquire the war-built plant known as Welland Chemical Works, located on the Welland River near Port Robinson in the Province of Ontario. The plant now produces ammonium nitrate fertilizer and other chemical products.

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Coordination and Research

(Continued from page 17)

(1) the German effort offset the German lack of raw materials, materials which to us are commonplace; (2) our only answer to certain of their missiles was our preponderance in the air, and we were none too soon in that; (3) suppose we presently had an enemy rich in raw materials and the "know-how" of using them.

It may be added that we should omit no effort to secure ourselves in the future as to substitutes or equivalents of raw materials outside our borders. Familiar instances are mica, tin, and quinine. Somebody may say, what have these three items to do with chemical warfare. The answer is, we do not know and our questioner does not know. The important matter is that the planning must be based on the "here" and the "now" and not on one or more substances only readily available in times of peace. Indeed, the first step in a research program for a given substance should be—do we have its constituents in quantity, and if not can we make them in quantity? When we reflect upon the pace at which we are using some of our natural resources, this matter has an added importance. You cannot fight a war with X if the enemy has the X. In the plans so far disclosed, your speaker finds little mention of this vital part of any program. It is not enough that we made rubber substitutes, that we conserved tin, that we managed to be supplied with bauxite, mica, etc. Those things in part strained our scientific manpower resources while we were in war.

It is to be expected that research, and production, if any, will have to be guarded against disclosure. It seems to follow that patenting is impossible and that those concerned must rely on good will and zeal just as was done in World War II. As a further safeguard, a problem or a product can be subdivided, as witness the atomic bomb.

Research by Consultants

There are at least 200 individuals, partnerships, etc., who are consultants, i.e., have more than one employer. Some have laboratories, some do not. Many are specialists. They are very discreet about the names of their clients and the precise nature of their work. Some, during World War II, were engaged on atomic bomb work and some were employed by the armed services in biological, chemical, and related matters. The problems in dealing with consultants are those of dealing with chemical enterprises. These consultants should not be overlooked as some have excellent laboratories for both pure and applied science, and those not so equipped may have outstanding personnel who, if the work requires it, can arrange with consultant laboratories for laboratory work. These consultants can also be used advantageously where highly confidential work is subdivided as mentioned above.

Research by Colleges

The colleges are probably best fitted to do pure research work, and several have equipment that is unusual. There is no need here to try and outline what colleges can and cannot do. It seems that they should be surveyed just as a chemical enterprise should be surveyed.

Research by Foundations, Chemical, Medical and Physical Sciences

There are also a number of research foundations and medical centers whose skill in organizing and whose personnel and equipment are of the highest order. Some of these foundations can do both pure and applied research. They, too, should be surveyed.

* * * * *

In closing, may your speaker remind you that the oceans have shrunk somewhat and planes and missiles fly uncomfortably fast. We have never really been prepared for any war. Our wars have been too long and too expensive in blood and treasure. We dare not disarm, so why not stay armed and thereby keep the peace? Our armament for peace lies in the very real, very earnest cooperation of the armed services and science in all its branches. Failing this, we will go down to disaster. Bravery, honor, patriotism, and such words will not avail us against modern weapons.

Ex-Prisoners

(Continued from page 28)

estly believe that if it hadn't been for Major Lazzarini I would have been a 'dead pigeon.' He boosted my morale; he saved my life."

It was during the four months the two men shared together at Cabanatuan that Sgt. Lloyd started on the road to recovery.

After this they were again separated. Major Lazzarini was sent to Japan in November 1942.

"It was just after the capitulation of Japan that we met again in Manila," said Sgt. Lloyd, "and now again, by some strange quirk of fate, we meet at Edgewood Arsenal."

1st Sgt. Joel Lloyd, now Recruiting Sergeant at the Chemical Center here, plans to make a career out of the United States Army. He "likes the fellowship, the clean, healthy life of the Army, and the benefits of the retirement plan."

Major Louis T. Lazzarini, also well pleased with Army life, is now Executive Officer of the Inspection Division at Edgewood Arsenal.

Chemical Corps Research

(Continued from page 21)

tested as promising medical treatments are DFP, diisopropyl fluorophosphate, and nitrogen mustards. DFP, developed as a nerve gas, has already been applied in the treatment of more than 100 cases of glaucoma, an eye disease, with results proving that it is far superior to any known treatment. The nitrogen mustard treatments used in more than 200 cases of cancer of blood and lymphatic tissues, Hodgkins disease, lymphosarcoma, and the leukemias have indicated that these compounds have done as well as the best known x-ray treatments. Both DFP and the nitrogen mustards are also now available for medical treatment.

Another development of the Medical Division which may prove useful to industries, such as steel mills, where radiated heat is a hazard, is the antiflash burn ointment. This ointment, developed in cooperation with the Navy, has proved successful against radiated heat and is now being tested in a number of steel mills. At the recent Bikini atom bomb tests the ointment was applied to the skins of the test animals. Results indicated the bomb flashes which charred the paint on certain ships did not injure the skin of these animals on the same ships.

Testing Division

The three divisions above concentrate their efforts toward research and development, but the newly developed items require considerable testing under all conditions before they can be standardized. The three remaining divisions, Dugway Proving Ground, San Jose Project, and Edgewood Proving Ground, have been established to provide the necessary testing facilities.

Dugway Proving Ground, at Tooele, Utah, is a well equipped testing ground where the largest scale field tests can be conducted. Here all full-scale tests on aerial bombs, both incendiary and gas, chemical mortars, and other types of chemical warfare munitions are conducted. A special project on micrometereological studies relating to gas clouds is also under way. Here battlefield scale smoke and gas cloud travel rates and concentrations can be conducted without danger to neighbors or their livestock.

During the war the preliminary studies for the bombing of cities were conducted at this installation. Replicas of parts of Japanese and German villages were constructed for testing incendiary bombs, dropped from aircraft, simulating so far as possible actual conditions.

The San Jose project, located on an island off the coast of the Republic of Panama, is an isolated tropical proving ground at which conditions normal to jungle warfare exist. Here the effects of heat, humidity, and meteorological conditions on chemical warfare agents, equipment, and material are determined. There is at this station an abundance of modern scientific equipment and facilities. Construction is also being planned for housing for civilian scientific personnel which are to be employed here.

The Edgewood Proving Ground, which for many years was the sole testing facility of the Chemical Warfare Service, continues to serve as the main service testing ground for items to be standardized, such as mortars, gas masks, detector kits, smoke generators and flame throwers.

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Methanol—from wood distillation
Ethanol —industrial grades from molasses and grain
Ethanol —from sulphite waste liquor and wood waste
Ethanol —anhydrous, Vulcan process
Ethyl alcohol—beverage, neutral spirits
Isopropanol
Allyl alcohol
Butanol

ACIDS
Formic acids
Acetic acid—from wood distillation
Acetic acid—from process residues and solvent recovery
Acetic anhydride
Propionic acid
Butyric acid
Stearic aid

ESTERS
Methyl acetate
Ethyl acetate
Butyl acetate
Vinyl acetate
Dibutyl phthalate

KETONES
Acetone
Methyl ethyl ketone

ALDEHYDES
Acetaldehyde
Butyraldehyde
Furfural

GLYCOLS
Ethylene glycol
Butylene glycol

ETHERS
Ethyl ether
Isopropyl ether

PHENOLS
Phenol
Naphthol

HYDROCARBONS
Butadiene
Heptane
Benzene
Toluene
Styrene
Diphenyl

MISCELLANEOUS
Citronellal
Geraniol
Essential oils

CHLORINATED HYDROCARBONS
Chloroethane
Chlorobenzenes
Chlorotoluenes

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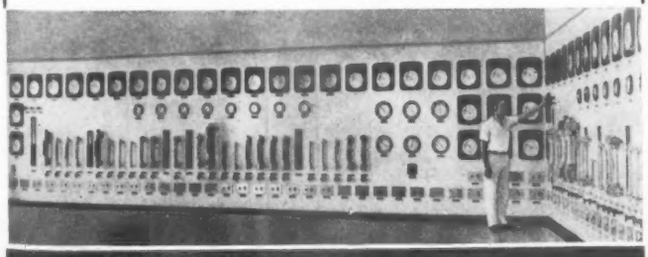

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War Department Research

(Continued from page 19)

The Army is spending during this fiscal year $281,500,000 for research and development. The largest part of these funds will be spent on development work at Army technical centers and through industrial development contracts. Basic research at universities and research institutes will consume approximately $70,000,000. The contracts for research and development are made by the individual technical branches. The funds allotted to these branches are as follows:

Quartermaster Service, Army	$ 2,500,000
Army Air Forces	185,500,000
Transportation Service, Army	1,000,000
Medical & Hospital Dept., Army	3,500,000
Signal Service, Army	25,000,000
Engineer Service, Army	6,000,000
Ordnance Service & Supplies, Army	52,000,000
Chemical Corps, Army	6,000,000
Total	$281,500,000

The Research and Development Division, set up under the existing temporary War Powers Act, cannot operate as the Navy's Office of Naval Research since it does not have Congressional approval. When the war powers are revoked by Congress the Army's research program will be governed by procurement regulations, in so far as funds and patents are concerned. The Army does not desire a return to the old method of competitive bidding on research operations.

Although the Army is now spending huge sums of money for fundamental research, it would prefer that this research be done outside of the War Department by some such organization as the proposed National Science Foundation. General Aurand states that "the Army can't keep science in uniform and would prefer that civilian scientists accomplish this research through an outside organization and tell them about it."

Tox Lab

(Continued from page 26)

for the control of leukemia resulted from early work in the Toxicity Laboratory, following the observation by Dr. C. C. Lushbaugh that these compounds attack blood-forming organs. The trials of nitrogen mustards against leukemia and Hodgins' disease were conducted in the Department of Medicine of Billings Hospital in collaboration with Dr. Lushbaugh. Further basic studies on a wide variety of related compounds are now being carried out by the laboratory. Investiga-

(Continued on page 50)

Educational Committee

(Continued from page 22)

that our Association can be of great help to Industry and to the Government in preparing for national defense.

I am emphasizing the chemical aspect at all times, for we are a chemical service. We undoubtedly have more chemically trained men in our Alumni than any other Service. Therefore, the Chemical Corps should be the focal point for chemical information. Ordnance, logically, is the focal point for information on steel products; Quartermaster for clothing, food, etc. Therefore, why should the Chemical Corps not be the Chemical Center in Washington. We, the Chemical Corps, have a great opportunity if we accept it. However, the Corps is now small, only some five hundred officers and they naturally are primarily interested in Chemical Tactical matters and in Chemical Warfare technical matters. We, as Alumni, are interested in the production side. Therefore, we must continuously advise the Service on production capacities, and especially on new products, which we feel should or might be of interest to them. The Service has pledged that it will listen interestedly and intelligently to our ideas. Therefore, the Alumni and the Chemical Industry have a definite and growing responsibility for national defense. The only way these objectives can be obtained is for the Corps to supply us with up to date information, and for us to build up a strong and active membership from our Alumni and from Industry.

The next point I want to make is that all of us know of many factors that caused mistakes and delays. Let us use our magazine to bring these points out. We do not want any destructive criticism, but only constructive ideas. We want to eliminate all mistakes of the past that we can, and the only way to do this is to make them public to our own group. You Alumni and representatives from Industry must supply this data.

Do your part and send in material that will be interesting to the members, and constructive to the Association.

Tox Lab

(Continued from page 49)

tions are also proceeding on the effects of a variety of toxic agents on growth and metabolism. In collaboration with Medical Division of the Chemical Corps and the cancer research group at Memorial Hospital in New York, an extensive program has been launched to screen a large number of compounds as possible anti-cancer agents.

Investigations are also proceeding on a number of agents which appear to be promising insecticides and rodenticides. Using special skills acquired during the war, another group is investigating the use of therapeutic agents in the form of aerosols against respiratory infections. Other studies are being pursued on the identification and treatment of poisoning by various toxic agents.

Thus the Tox Lab is contributing to a new chapter in the military and scientific history of the United States. The program is keynoted by a close collaboration between the staff of the laboratory and Army and Navy personnel. With a sharp awareness of the prewar curtain of uncertainty and misinformation that shrouded the subject of chemical warfare, the staff of this young organization is determined to plunge a dagger of enlightenment into the worst enemy in war or in peace—ignorance.

Setting of Slurries

(Continued from page 42)

materials were examined including: high-test hypochlorites, ordinary bleaching powders, stabilized bleaching powders, and special products. Simple test procedures were devised for determining the set points of bleach-water slurries and the characteristics of setting of slurries of various types of bleaching materials were determined. It was found that, on cooling, slurries of some ordinary bleaching powders and stabilized products set to a pasty or gelatinous mass at temperatures above freezing. Setting was apparently connected with high calcium hydroxide content in the presence of considerable calcium chloride. Certain high test bleach-water mixtures set on mixing at room temperature; setting was apparently due to the hydration of calcium hypochlorite. The most effective means of preventing setting was the use of an antisetting substance. Of the materials studied for this purpose, sucrose was found to be the best.

LITERATURE CITED

1. Bennett, H. T., Storey, L. G., and Beckley, H. B., U. S. Pat. 1,806,734 (1931).
2. Bennett, H. T., U. S. Pat. 1,820,295 (1931).
3. Brady, O. L., *Science Progress, 31*, 97-103 (1936).
4. Bunn, C. W., Clark, L. M., and Clifford, I. L., *Proc. Roy. Soc.*, Series A, *151*, 141 (1935).
5. Gonell, H. W., *Zement, 18*, 372-6, 437-41, 472-4 (1929).
6. Griesheim-Elektron Co., German Pat. 188,524 (1906).
7. Griesheim-Elektron Co., German Pat. 195,896 (1907).
8. Kraut, *Ann., 214*, 354 (1882).
9. MacMullin, R. B., and Guyer, J. A., U. S. Pat. 1,754,473 (1930).
10. Milikan, J., *Z Phys. Chem., 92*, 59-71 (1916).
11. Neumann and Haebler, *Z. Elektrochem. 35*, 909 (1929).
12. Ochi, S., *Proc. World Eng. Cong., Tokyo, 1929, 31*, 537-42 (1931); *C. A. 25*, 5147.
13. O'Connor, E. A., *J. Chem. Soc.*, 2700-2710 (1927).
14. Odling, *Deutsche Ausgabe, 1*, 59 (1861).
15. Ourisson, J., *Att. 10th Congr. Inter. di Chimica, 4*, 40-51 (1938).
16. Reitz, H., and Ehlers, H., U. S. Pat. 2,244,477 (1941).
17. Weiser, Colloid Chemistry, John Wiley and Sons, Inc., N. Y. (1939), pp. 255 and 291.

Crusade Against Cancer

(Continued from page 30)

report that the nitrogen mustards do not cure any form of cancer, but they do prolong life in many instances, and bring about remarkable remissions in a few cases. These chemicals were most effective in Hodgkin's disease, where results were as good as those obtained with the best X-ray treatment. They even gave temporary relief to some Hodgkin's disease cases which no longer responded to X-ray treatment. They also made an occasional "X-ray fast" case again responsive to X-ray treatment. They therefore represent an advance in the treatment of selected cases of Hodgkin's disease.

The response of lymphosarcoma was spotty. It helped some cases, but not others, for reasons not yet understood. It failed to help any of the acute or subacute leukemia patients, but helped half of the chronic leukemia cases to about the same extent as x-ray. It proved useless in other forms of cancer. Other cases treated with the nitrogen mustards at Memorial Hospital in New York, Walter Reed General Hospital in Washington, and in hospitals in Chicago have not yet been reported.

The Chemical Corps has made a sufficient quantity of highly purified nitrogen mustard available to the National Research Council Committee on Growth for wider clinical tests. This is being prepared in treatment sets through the courtesy of Merck and Co., Inc., Rahway, N. J. At present it can be distributed only to selected cancer study clinics, because it has not been certified by the Food and Drug Administration for public sale and general use in medical practice. This is wise because there is only a narrow margin of safety between the dose which will benefit the patient and the dose which will seriously injure his bone marrow and possibly endanger his life. The only three nitrogen mustards tried in cancer so far are the three which were selected and intensively studied as war gases. More than sixty additional nitrogen mustards have been made in the chemical laboratory, but not used as war gases. It is among these compounds that the Medical Division will first search for better cancer drugs. However, the search will not be limited to any one class of compounds, but in time will cover a wide variety of different types of chemicals.

Cancer is one of the most baffling and difficult fields of medicine. It is not possible to predict whether a cure for any of the various forms of cancer will be found. If one should be found, the small cost of this research will be repaid many times over in the resulting benefit to mankind.

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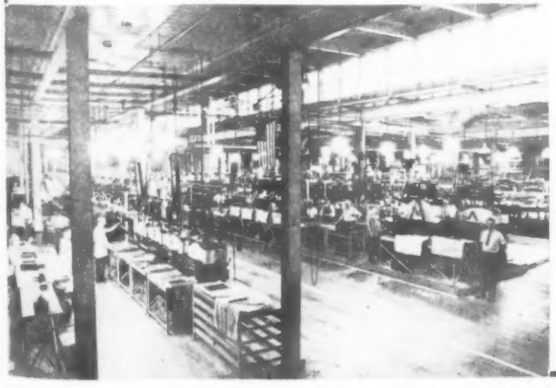

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Reppe Chemistry

(Continued from page 7)

ing alkinols. For example, formaldehyde reacts to form propinol.

$$HCHO + HC\equiv CH \xrightarrow[5\ atm]{100^\circ\ C.} HC\equiv CCH_2OH$$

The catalyst may be the acetylide of silver, gold, mercury or copper. The copper compound is usually used. It will be noted that the triple bond remains intact and the resulting propinol is a very reactive raw material for the production of other chemicals. For example, oxidizing gives hexa-2, 4-diine-1, 6-diol, the hydrogenation of

$$HOCH\ C\equiv CH \xrightarrow[CuCl_2]{\cdot 2} HOCH_2C\equiv C-C\equiv C-CH_2OH \xrightarrow{H_2} HO(CH_2)_6OH$$

which gives hexamethylenediol.

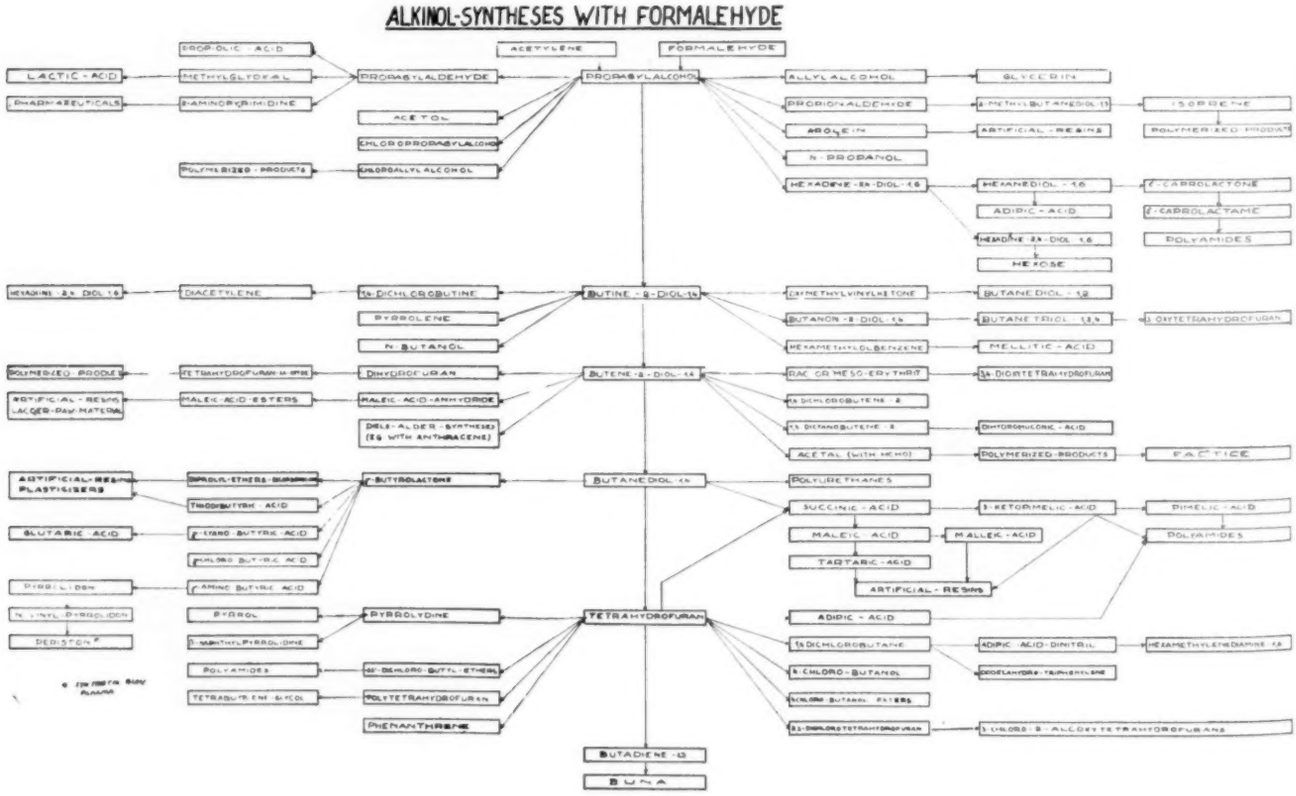
Some evidence of the scope of Reppe's ethinylation is indicated in Fig. 3.

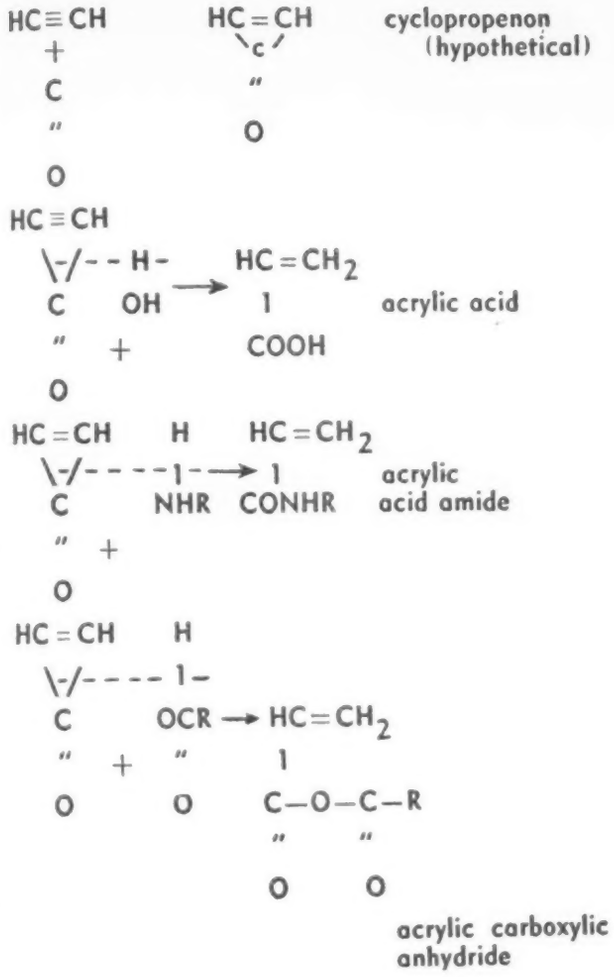
In manufacturing polyethylene, Reppe went all out on his favorite synthesizing tool, namely, pressure. Ethylene, mixed with minute amounts of oxygen as a catalyst, was pumped at a pressure of 1700 atmospheres (25,500 p.s.i.) through small, heated reaction tubes, and the resulting polymer was collected in expansion chambers.

Reppe's work on vinylation will not be discussed in this article except to mention one reaction of importance involving a-pyrrolidone. This amine reacts with acetylene to form vinyl pyrrolidone, a dilute saline solution being known as Periston and used successfully as a substitute for blood plasma. The human body can tolerate 50 percent of blood stream as Periston.

Reppe's third contribution of major importance involves the use of carbon monoxide (C=O) as a reacting agent. This chemical synthesis is known as "carboxylation." In this type of reaction the carbon monoxide reacts with the catalysts to form a carbonyl. The carbonyl then reacts with acetylene to complete the reaction. The following simple reactions indicate some of the possibilities of carbon monoxide and acetylene: (See diagram at head of next page.)

It is interesting to note that while Germany lacked many raw materials she had stock-piled enormous quantities of materials, notably the light metals. She was low, however, in fuels and rubber. Had Reppe's processes been six months in advance of what they were, it is safe to venture the guess that the war would still be in an active state. I was interested in seeing in factories built as late as 1944 that the materials in use were of excellent quality and no pains had been spared to lessen the quality of construction.





Every effort was made to make all processes completely automatic. In this Reppe was adamant. He could not tolerate any process which was not continuous.

With our great natural gas reserve, it seems to me that the works of Reppe should be of direct benefit to our industries manufacturing plastics, pharmaceuticals and textiles. With leather as scarce as it is, our interest in certain plastic substitutes should be keen. Germans preferred plastic belts over leather for power transmission.

Items that should be investigated, all of which in one way or another relate to Reppe's work, include:

- Low temperature lubricants. (Esters of adipic acid)
- Water repellents. (Ethylene imines)
- Synthetic detergents.
- Di-isocyanate resins for paper treating.
- Plastic magnetic recording tapes.
- Plastic foams for acoustical and thermal insulation.

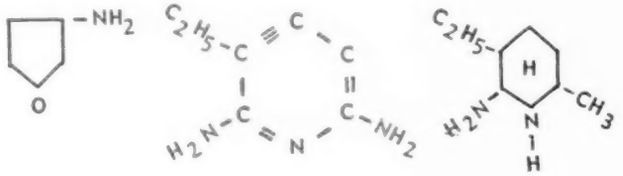
What should be done with Reppe? Reppe, so far as I know, is still in Germany. He has been offered a contract to come to the United States. This he turned down. Reppe has one ambition and this is to rebuild the I. G. Farben Industrie and, as he so aptly puts it, to become the new chemical fuehrer of Germany. I believe we would gain little bringing Reppe to the U.S.A., unless we brought a host of his henchmen. I believe it would be better to let Reppe go back to Ludwigshafen, where his best work could be obtained.

Reppe indicated to me that he would like to work there on the following subjects:

1. Investigate and produce allyl resins from allyl alcohol and butenediol, esterifying with dicarboxylic acids such as oxalic, glutaric, adipic, pimelic and suberic acids.

2. Study the use of supersonic waves as polymerizing agents. In this work he would be assisted by Professor Easu, an authority in that field.

3. Formulate new methods of preparing sulfa drugs from

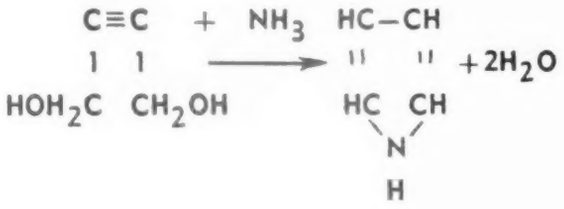


4. Production of styrene directly from acetylene, using modified nickel carbonyle catalysts.

5. The possible gradual replacement of carbon monoxide by triphenylphosphin, and the similar radicals, including triphenylmethyl, silanes, boranes, and quadrivalent nitrogen, such as dianisyl nitrogen oxide.

6. Study the reaction of carbon monoxide with phenol.

7. Study the commercial possibilities of the following reaction:

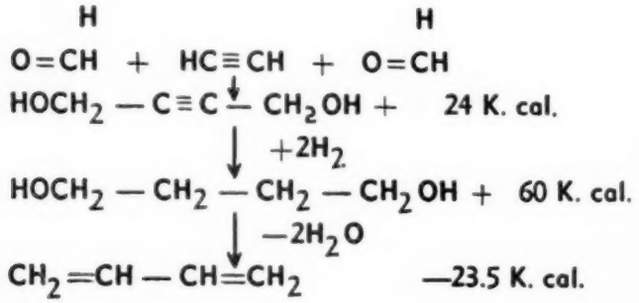


Synthetic Rubber

These and several other projects would keep Reppe busy for many years to come.

With Germany's supply of natural rubber prac-

tically none, efforts were expended to make a synthetic rubber. Buna S, or a styrene-butadiene rubber, was extensively used. Large quantities of butadiene were made by Reppe's synthesis as follows, using formaldehyde and acetylene:



In concluding this article, I would like to give Kudos to Gen. Hugh Rowan, Col. Pat Powers and Col. H. Woodward. At one time or another during my eight months' association with Reppe, they were my commanding officers. At all times they gave me a free rein to handle Reppe as I saw fit. They made it possible for me to obtain the services of expert technicians like Dr. Karl Fischer to assist in translating the most illegible script of Reppe's pen.

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The Secretary's Corner

By JOSEPH SCHWIMER, *Capt., Cml. Res.*
Secretary-Treasurer

As the skies brighten over our great country, and income tax time grows 'nigh, all of us whose lives were altered by war wonder what 1947 will bring.

We are entering into the second year of our existence, although officially our constitution and by-laws were adopted and the Association legally launched in May 1946.

Since last May I can report quite frankly that your executive committee set the pace, strategy and tactics of our future campaign for expansion on a high level, and probably too optimistically.

The leg work rested with your secretary-treasurer, and I confess that my legs and my tonsils are quivering as the result of my humble efforts during the past three months.

But I think we've come a long way, although we are only about halfway down a long, hard road. We have no five-year plans, but we do have the initiative and will plough ahead so that our successors in office will find the going somewhat easier.

We now have 19 organized chapters, with 4 more in the books for early 1947. To my way of thinking, this is a remarkable accomplishment. The big job ahead for the chapters is to hold meetings of interest to all its members and not for a select few. We have received wonderful reports of successful chapter meetings. I have attended some of them in my travels and I rendered enthusiastic reports to the executive committee.

Many of the chapters want lists of soldiers who served during the war who might be living within the geographic bounds of their immediate chapter. We are endeavoring to obtain these lists from headquarters and as soon as we receive them they will be sent out to the interested chapters. However, checking with other associations, they are up against the same blockade. The various technical services have not been given the correct addresses because the AGO has not received them. We hope that each chapter will endeavor to obtain these lists from the Army headquarters nearest the chapter.

The *Journal* and the *News* are going to many libraries, colleges, universities and other spots where our name is gathering fame. We have received many inquiries concerning membership because some of our members have kept the magazine on their desks and visitors could not help but see the colors and inquire about the Association.

I find it somewhat difficult to obtain as many of the group memberships as I anticipated. Why some companies have suddenly dropped interest in the Chemical Corps is apparent to some of us, but I cannot reconcile the fact that they have refused to join the Association because of lack of interest in the preparedness program. Certainly industry knows that without a good industrial backbone no army can survive. Many of our members have joined so that they might discus in the chapter meetings ways and means of improving chemical procurement and procurement planning.

Returning to our chapters, I report that we have now 19 active, with a Cleveland chapter just about ready to organize. We are in high hopes that Philadelphia, western New York, southern Michigan and St. Louis will organize soon after the Industry-Army Day Conference in Chicago on January 17. Our total membership is above the 3,000 mark.

I cannot close without some kind words about the assistance rendered us by the American Chemical Society and the Chlorine Institute during the past few weeks. All I can simply say is thank you.

We are now in the throes of making plans for our second annual meeting at Edgewood Arsenal in May 1947. We welcome suggestions from our chapters so that a proper agenda may be set up. Some chapters want to know what the others are doing and we hope that this information will come from the chapters so that we may include it in the columns of the *Journal* for the benefit of all concerned.

The big task ahead is to hike our membership list and interest more members from the industrial and scientific field as well as from the ranks of the Chemical Corps.

The executive committee has been working very hard and I can report that we are progressing, as I have said at many a chapter meeting, slowly but cautiously. In National Headquarters we are now setting up membership lists alphabetically and geographically. Within a short time we are going to run off on the addressograph machine lists of our entire membership and make them available to the chapters.

Coordinating Committee

(Continued from page 4)

closer cooperation between the military associations. Gen. Royall manifested keen interest and commended the CWA for the aggressive spirit which motivated a program to biuld and maintain improved understanding between Industry and the War Department. Col. Codd, with many years of military association experience, contributed constructive recommendations and offered to assist and cooperate in such a movement.

To further deevlop the possibilities of this combined activity, Col. Codd sponsored a luncheon for the most active local officers of six military associations. In attendance were Col. I. F. Bell, Society of Military Engineers; Mr. Edward Fox, Quartermaster Association; Brig. Gen. S. N. Sherrill, Signal Corps Assoication; Col. W. S. Fitch, Air Force Association; Col. J. N. Phalen, Association of Military Engineers; Col. L. A. Codd, Ordnance Association, and Col. Ludlow King, Chemical Warfare Association. The plan was presented for consideration and was received with unanimous enthusiasm. The enthusiastic desire of the representatives to participate in such a broad cooperative plan led to the formation of the Coordinating Committee of Military Associations.

Two additional members of the committee, Col. I. I. Greene, Infantry Journal, and Col. W. H. Clapton, Transportation Association, became members of the committees at a later date.

The Coordinating Committee was formed with the understanding that it would be an informal group with no direct authority over the various member associations. It's main purpose was to serve as a center for the discussion of general plans, which if acceptable to the respective associations, could be promoted with the combined effort of all the groups. The committee also provides a representative group to which the War Department can present its programs and requirements.

After the Coordinating Committee plan had been accepted by the Military Associations, Gen. Royall, at a luncheon attended by the chiefs of the various services, acquainted the Army's leaders with the purposes and activities of the committee.

After a conference with the Executive Committee of the Chemical Warfare Association concerning the desirability of a joint Industry-Army meeting, the chairman requested the C.C.M.A. members to consider seriously its

(Continued on page 64)

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CHAPTER NEWS

ATLANTA CHAPTER

The Atlanta Chapter is off to a flying start. With the banquet hall at Georgia Tech made available to the members for their meetings, Mrs. L. G. Zachos, Secretary, reports that the turnout increases with every meeting.

On November 13 the following permanent officers were elected: Dr. Frederick Bellinger, President; Frederick T. Lense, Jr., 1st Vice President; Dr. Orville E. May, 2nd Vice President; Mrs. L. G. Zachos, Secretary-Treasurer; Prof. E. Earl Royals, Director; C. H. Bronson, Director; Col. George W. Morcock, Director; Col. Thomas H. McHatton, Director.

Following the dinner, the members heard from a speaker and saw some interesting movies. Future programs will feature top flight speakers.

Mrs. Zachos is working tirelessly to build up the membership and reports good progress. The chapter is working on a constitution and by-laws and will present same to the National Headquarters for approval.

The chapter is discussing the possibility of setting up dues for the local chapter to implement the credit set up in National Headquarters for each member.

A membership drive is under way in the Atlanta area and, according to reports from Mrs. Zachos, the results are satisfactory. But the members are working hard on various committees to make Atlanta one of the most active chapters in the Association.

The address of the Secretary-Treasurer is: Mrs. L. G. Zachos, Zac-Lac Paint & Lacquer Co., 350 Simpson St. N.W., Atlanta, Ga.

BALTIMORE CHAPTER

Edward M. Hoshall, President; David E. Bufter, 1st Vice President, and Paul Bauman, Secretary-Treasurer, report that the Baltimore Chapter is progressing nicely.

The speaker at our first meeting was Col. L. E. Fellenz, Commanding Officer, Camp Detrick, Maryland, and at our last meeting Lt. Col. Reilly of Camp Keesler addressed the members. Our attendance has been increasing at each meeting and we seem to be gathering a little momentum. Col. Ragnar Johnson of the Second Army Chemical Office is giving us some wonderful support and we believe as soon as our membership committee starts rolling we will really go to town. Our main problem at present is to secure suitable meeting quarters at no charge.

The first issue of the *Journal* was enthusiastically received and we feel proud of the fine job that has been done. The *Journal* is most informative and very well edited.

Captain Bauman threw a posey at ye editor's writing. "Being connected with newspaper business, I can well appreciate the effort necessary to produce such a publication," he said.

CHICAGO CHAPTER

The Chicago Chapter at its meeting on October 28, 1946, adopted the following recommendations and requested that the national association take appropriate action.

The National Chemical Exposition, held in Chicago, September 10-14, 1946, is reported to have attracted 46,000 executives and technical and research workers from all parts of the United States.

Provision for an exhibit of the activities of the Chemical Corps, with emphasis on research and technical achievements, at such an exposition is considered most desirable and favorable by the Chicago Chapter.

This exposition is not an exclusive Chicago affair, but is normally held in alternate years in Chicago and New York. It is also expected that this exposition will be extended to San Francisco in 1947 (*sic*) and later to other cities.

It is therefore recommended that the Chemical Warfare Association take steps, on a national basis, to insure that an exhibit of the technical and research activities and achievements of the Chemical Corps be included as a part of the National Chemical Exhibitions.

It is further recommended that the possibilities be explored to insure an exhibit of these activities at other appropriate research and technical expositions and conventions.

The executive committee wishes to report that the American Chemical Society is enthusiastically supporting the Chicago proposal and is making every effort to extend facilities to the Chemical Corps at the next annual chemical exhibition. The executive committee will appreciate any additional suggestions for the exhibit.

CLEVELAND CHAPTER

Word received from Orville Kenworthy, Lt. Col., Chemical Reserve, is that the organization

of the Cleveland Chapter is progressing slowly. He has sent letters to some fifty Chemical Corps reserve officers and is calling a meeting for January. The Ferro Enamel Corp. is the group member signed to date in Cleveland, and Ralph L. McGean, Vice President of the McGean Chemical Co., joined as a life member.

There are 20 members signed under the Ferro Enamel Corp. membership. Louis Nadeau, former Chemical Officer on Tinian, who is now home in Cleveland Heights, is assisting Mr. Kenworthy with this organization. As soon as Cleveland is organized and requests the charter, it will make the twentieth chapter of the Association.

DUGWAY CHAPTER

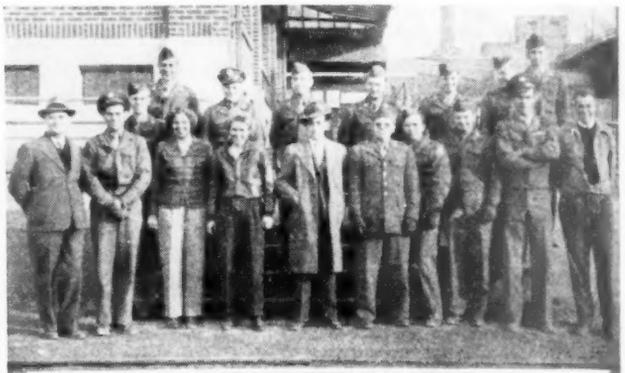
Due to the unstable conditions that still prevail at this station, several of the duly elected officers of the Dugway Chapter have left the post and it has been necessary to elect new officers to fill the vacancies. The present officers and committee members of this chapter are now:

President, Dr. James L. Wilding; 1st Vice President, Howard Lanier; 2nd Vice President, Theodore R. Paulson; Secretary-Treasurer, John Crossen; Board of Directors, Jesse Cannon, Lt. Col. Sam Efnor, Jr., William H. Thompson; By-Laws Committee, Lt. Col. Sam Efnor, Jr., William H. Thompson, Dr. James L. Wilding; Program Committee, Howard Lanier, chairman, Maj. Hiram Conant, Capt. Anna Frost, Donald C. Munch, Charles L. Helm; Membership Committee, M/Sgt. Herbert P. Ohm, chairman, Capt. Lawrence E. Remick, Gilbert C. Bowen, Charles L. Helm; Publication Committee, William H. Thompson, chairman, Lt. Comdr. James E. Hartung, John Crossen.

Monthly meetings have been held during the fall months and plans have been made for an active winter season. At the September meeting we were honored by having Dr. Francis Marzulli from the Medical Research Laboratory at Dugway Proving Ground give an excellent talk on aviation physiology. Dr. Marzulli outlined the extensive training that combat pilots have to go through to become familiar with the hazards and conditions encountered under high altitude flying.

At the October meeting we had the pleasure of having Dr. J. H. Christiansen from Department of Geology at the University of Utah give a lecture on geology of Utah State, and particularly of the dried-out Lake Bonneville area in which Dugway is located. The lecture was richly illustrated by slides showing photographs and diagrams of rock formations and mountain scenes. A question and answer period followed the lecture, which resulted in a lively discussion.

The November meeting was postponed until December 3, due to the Thanksgiving holiday. This meeting was held as an all-day inspection tour to the plants of the International Smelting and Refining Co., near Tooele, Utah, about 50 miles from Dugway. Approximately 20 members and guests took the opportunity to make this



GROUP OF DUGWAY CHAPTER MEMBERS ON AN INSPECTION TOUR TO INTERNATIONAL SMELTING AND REFINING COMPANY, TOOELE, UTAH

trip, which proved to be both interesting and educational. Guided by a competent representative from the company, the group was shown the various processes of crushing the ore, removal of waste materials by the flotation method, and smelting of the metals.

DALLAS CHAPTER

To date two meetings were held by the Dallas Chapter. The first preliminary meeting convened on 25 June 1946 at Headquarters, Dallas Chemical Warfare Procurement District, and the following officers were elected: Ray A. Lamb, President; John E. Mitchell, Jr., Vice President; W. W. Taggart, Secretary-Treasurer; W. P. Stone, Membership Chairman; Albert Pranger, Program Chairman.

The second meeting was a luncheon on 22 July 1946, held at the Stoneleigh Hotel, Dallas, Texas, for purpose of reviewing plans regarding the local chapter and its future activities.

At the meeting on 22 July 1946 it was decided to hold all future meetings in the form of a stag, preferably in the evenings since noonday meetings interfered with the normal working day of the majority of the members and also allowed very little time for a discussion and "gettogether." The first regular meeting of the chapter was held at the end of September. Regular meetings have been scheduled once a month since then.

The program chairman will attempt to obtain a topflight speaker for each monthly meeting, preferably one well versed in scientific data and capable of putting his subject across to the group in language understood by all.

Every effort is being exerted by the member-

ship chairman to obtain maximum membership at the earliest possible date. The membership chairman has also undertaken to begin a nucleus of Chemical Warfare Association chapters in the major cities in the 13 states under jurisdiction of the Dallas Chemical Warfare Procurement District.

HAWAII CHAPTER

Hawaii Chapter now reports a total of 22 members, having received an additional nine at the last drive, according to Capt. Eugene E. Monk, Secretary-Treasurer.

The chapter reports that ships carrying the *Chemical Corps Journal* were apparently making deliveries by way of Tokyo and therefore there seems to have been quite a delay in receiving their favorite magazine. Capt. Monk said he is glad to report that the *Journal* has made a big hit.

The chapter reports that 1947 meetings are being set up and interesting news will be forthcoming for the benefit of chapters in the U. S.

(Ed. Note: Membership cards have been forwarded to the new members, including the one that Lt. Col. Delmore did not receive.)

NEW YORK CHAPTER

On November 20, 1946, the New York Chapter met with 178 members and guests at 2 Park Ave. The meeting was preceded by a dinner and the usual refreshments. Featuring the session were speeches by Maj. Gen. Alden H. Waitt, Chief, Chemical Corps; Robert T. Baldwin (whose speech will be found elsewhere in the *Journal*); Col. Fred Gerhard, Chemical Officer, First Army; Sid Kirkpatrick, and Joseph Schwimer, Secretary-Treasurer, CWA. Charles Miner, president of the New York Chapter, presided. Among the distinguished guests were S. Willard Jacobs, Vice President, Niagara Alkali Co.; Col. George J. B. Fisher, and prominent businessmen and former soldiers of CWS.

Gen. Waitt outlined the importance of the Association to the Chemical Corps. Said Gen. Waitt: "The success of this New York unit is vital to the success of the Chemical Corps Association, and the success of the Association is vital to the success of the Corps.

"It is suggested that I talk to you about the postwar program of the Corps. I am not going to orate at all on the importance of the Association. I think you understand how important it is or you would not be here tonight. I hope that you will lend your own efforts to expanding this unit of the Association. New York should have the strongest chapter and I think it will, but it is going to take some work on your part. There is also going to be a tendency to let things drop after a short time—after the impetus has died down. But we must not let that happen.

"In our postwar program there are these things which are of the greatest importance: first, research and development. That is my first task—to assure a strong research and development staff organization, and right along with that is the

CHARLES MINOR
President, New York Chapter

procurement planning program. Research and development and procurement planning are of tremendous importance. Of tremendous importance also is the provision for a reserve—a reserve of chemical warfare material—the assurance that we have available a good supply of the means of waging chemical warfare. Reserve training is of very great importance. That is something that we will have to carry on—beginning right now.

"And then, in the Regular Army, one of the important things that faces me is the education of our regular, younger Army officers—train them that they can bear their share of the load when the time comes. We only had 95 officers before the last war and the number expanded to 8,000. I suppose we will have from 250 to 300 when the smoke settles and we get our permanent Regular Army. They must be highly trained officers to be able to pass on their experience and knowledge. That has to be done at some little expense. I have sent some of the best officers I have—youngsters—you know them—to college this year. I have them in Stanford, MIT, Army Industrial College, University of California, Ohio State, Purdue and Leavenworth. I need them

badly now, but they are going to be needed more in the years to come.

"Now we have research and development, reserve training, the preservation of reserve stocks.

"We must be supplied with funds to give us stocks of weapons—in being—not on the drawing board—not in the laboratory.

"I am aghast at the thought—the requirement is so great—and yet I wonder are we going to be able to do it? Because, in this democracy of ours, people are not aware of the dangers that confront them. So, somehow or other, if we are to succeed in this next war, we must have the means at hand. It won't do any good to have the best scientists and industrialists. We must have stocks on hand to use in case of attack, and officers trained to use them and to protect them. It looks like a terrific job and you are here as members of an Association which is concerned with this. The Chemical Corps Association can do much to forward the effort of chemical preparedness through its members of the Association. You can provide us with advice—the best brains of the chemical industry and science should be here in the membership of the Association. Industrialists may serve on committees to assist us in our procurement planning. Scientists on committees may advise on the research and development program. I look for help from a committee of the Chemical Corps Association which can, perhaps by suggestion, aid us.

"It seems quite appropriate to me that our Chemical Corps associates should have a committee and research and development, should have a committee on procurement planning, and they would, through their general knowledge, be able to help a great deal.

"Where in the Service we are dealing with these problems every day, we are liable not to see the woods because of the trees, and you can stand off at a distance and see some of these problems more critically than we can see them. You may form a liaison between civilian effort and the Army. You can help keep informed as to what the Chemical Corps is doing and you can translate that to the general public. You can tie our wartime members—tie them in with the Corps—form a bond between the chemical industry and the military. I think you can do a great deal to keep the public informed as to the Chemical Corps in the national defense.

"Yes, this is a proper weapon—this is an intelligent weapon—this is an officer weapon.

"Help keep the public informed as to what we are doing—what we ought to be doing—our place in the national defense. Emphasize the fact that we are vital to the national defense. Give us your moral support—and moral support is a very important effort. I have learned the value of real friends and the tremendous importance of moral support. I look to the Chemical Corps Association to give their moral support to the Chemical Corps.

"You can maintain those old associations which grew up during a long, hard period of war. You can keep the bond of friendship. You can maintain that spring which is so important to the success of any group.

"This covers what I have to say. I am tremendously convinced of the importance to the Corps of the Association. We need your help."

Mr. Minor pointed out that it is their purpose to have a strong New York chapter to carry out the aims and purposes outlined by Gen. Waitt.

Col. Gerhard spoke on "The First Army Plans for Reserve Officer Training." He gave the set-up of the First and Second Service Commands taken over by the First Army and he stressed the fact that there is considerable activity ahead. He said that approximately 70 percent of the officers separated signed up for the reserves. He also stated that the organized reserves are going to operate very much like the National Guard once they get going. His talk was well received and the Colonel said he is always available to give the latest information on reserve activities.

At the conclusion of the meeting Mr. Kirkpatrick gave some introductory remarks about motion picture "Operations Crossroads." This picture was very interesting and many questions were asked of Mr. Kirkpatrick at the completion of the film.

The New York Chapter is planning similar meetings for 1947.

ROCHESTER CHAPTER

The third combined winter meeting of the Rochester Chapter and the Official Inactive Duty School was held on November 27. The conference speaker was Dr. Edwin O. Wiig, University of Rochester. His subject was "Contributing to the War Effort From Behind the Scenes."

He confined his remarks to pertinent information, authorized by the Chief of Technical Division, Chemical Corps, to the secret research work conducted under contract at the university on processes for activating charcoal for gas mask canisters so as to be very effective against new

gases. The address and discussion was very interesting and informative. Fifteen persons were in attendance.

The occasion was highlighted by an award being made to Mr. Robert Keefer, a civilian CW inspector at the Monroe Ordnance Co., for his excellent performance of duty in spite of severe burns received on two different occasions when the flame throwers being tested backfired.

The chapter is contacting various companies who it is believed are interested in the future welfare of our Association and the Chemical Corps. We hope to have reports on progress of these contacts very soon.

Robert Keefer Awarded Highest Civilian Army Award

Robert Keefer receiving from Col. Crowell the Exceptional Civilian Service Award for "conspicuous bravery and devotion to duty" while serving as Inspector, New York CW Procurement District. Keefer repeatedly was exposed to severe personal injury in order to secure necessary tests and data on flame throwers.

SAN FRANCISCO CHAPTER

The San Francisco Chapter reports progress, but due to the holidays the activities of its committees will not be fully reported until the April issue. The officers of the San Francisco Chapter are: President, Lt. Col. Philip J. Fitzgerald; Vice President, Col. Frank M. House; 2nd Vice President, Col. W. P. F. Brawner; Secretary, Lt. Col. Burton D. Willis; Treasurer, Mr. C. L. Lambert; Recording Secretary, Mrs. Grace C. Barbee; Board of Directors: Col. J. W. Lyon, Col. Edwin C. Maling, Lt. Col. E. M. Prince, Lt. Col. L. A. Nichols.

SOUTHERN CALIFORNIA CHAPTER AT LOS ANGELES

The Southern California Chapter of the Chemical Warfare Association at Los Angeles held its organization meeting on December 3, 1946, and elected the following officers: Albert C. Bilicke, President; W. J. Bailey, Jr., 1st Vice President; Jay S. Lerner, 2nd Vice President; Robson English, Secretary-Treasurer.

There were present at the meeting nine members of the chapter and William T. Norman of the New York Chapter, plus six guests invited by the members. Two of the six guests immediately joined the Association.

The beginning of our new chapter may, at first hand, appear rather limited but it was our firm intention to start initially with a small group, all of whom are known to be interested and who are also good workers. Prior to the appointment of committees, a discussion was had as to their organization and number. Here again our decision was to concentrate on what we believe to be most vital at the present until our growing membership permits a more comprehensive organization.

The two committees appointed were: Membership, Albert C. Bilicke, chairman; Messrs. Bailey,

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Collette, Woodrow W. Crank, English, W. W. Fitkin, Gordon B. Kaufmann, Joseph E. Lammersen, Lerner, Arthur L. Park, Julius Perler and R. Keith Ryan. Program: Arthur L. Park, chairman, and Messrs. Collette and Lerner.

We hope to have our first general meeting shortly after the middle of January, though this is only tentative at this time. In the matter of selection of appropriate subjects for our meetings, our committee is planning to meet next week.

Col. Bilicke writes that he has some ideas and wants other chapters to send him theirs. He writes: "I feel that academic treatment of CW tactics or troop employment has no place at all in our schedule. Such information can be had through troop or correspondence school for the reserve military people and will for the most part only bore our civilian listeners. On the other hand, a carefully prepared and not too obtruse lecture on BW or a lecture on the probable requirements of dispersion and collective protection against atomic explosives, while it gets into the Engineer territory, still is a part of the problem facing the Chemical Corps.

"The foregoing are merely supplemental 'drawing cards,' so to speak. On the whole, the program should cater to the industrial people, both civilians, as such, and CmlC reserve officers in industry by bringing to their attention selected new items of materiel and pilot plant processes being developed by the Corps and their relation to industry. This will definitely raise security questions as to 'how much'; admittedly a line will have to be drawn, but we are not going to get anywhere if this is too arbitrarily handled. This is a pressing question which has already repeatedly been raised.

"In closing, I wish to thank you for your very prompt action in granting us our charter and trust that we may either see you (meaning your Secretary) or one of the National Officers out here before too long."

Albert C. Bilicke.

WASHINGTON, D. C., CHAPTER

The Washington, D. C., Chapter had a very successful dinner meeting on December 4 at the Roger Smith Hotel. Approximately 100 members and guests attended, including Maj. Gen. Waitt and several outstanding visitors from industry. The meeting opened with a salute to the flag, followed by an excellent turkey dinner. After the dinner, General Waitt made a brief address indicating his interest in the Association, and then left early to board a plane for an important trip. A young magician who is a student in one of the Washington junior high schools, assisted by his younger sister, then proceeded to mystify the brains of the chapter by sleight-of-hand tricks, much to the amusement of the assembled group. A short, humorous talk was then made by Bob Addie, Special Feature and Sports Writer of the Times-Herald newspaper. Mr. Addie's talk was principally with respect to the amusing incidents which occurred in England when he was on duty as a Lieutenant and later as Captain with the AAF. This initial get-together of the Washington Chapter was very successful.

Due to the fact that several officers and directors of the Washington Chapter have left this area, the Executive Committee met on October 18 and filled several vacancies. The following constitutes the present officers, board of directors and chairmen of committees of the Washington Chapter: President, M. F. Peake; 1st Vice President, Albert W. Jacobson; 2nd Vice President, John W. Stockett; Secretary-Treasurer, Wayne W. Fort; Directors: Charles Pledger, Lt. Col. John J. Hayes, James B. Costello, Meyer Neishloss, C. H. Small, George Raymond, Ruth LaFoy, Maj. Osmund L. Varela, Robert M. Oremland; chairmen of committees: Membership, Archer Roberts; Meetings, Maj. Osmund L. Varela; Nominations, Alex Leggin; By-Laws, Charles Pledger.

WILMINGTON CHAPTER

A very successful meeting was held at the YMCA, Wilmington, Del., November 25 when the Wilmington Chapter of the CWA was officially organized.

Maj. Gen. Alden H. Waitt, Ludlow King, president CWA, Col. Harry A. Kuhn, Alex Leggin and Joseph Schwimer, secretary-treasurer CWA, made the trip from Washington to outline the organization to some 40 men from Wilmington who attended.

Dr. W. E. Lawson, Development Department, E. I. duPont deNemours, Inc., presided and described his reactions to the first annual meeting which was held last May at Edgewood Arsenal. M. G. Milliken, Vice President, Hercules Powder Co., voiced the opinion that the Wilmington Chapter should be formed and upon his motion the chapter was organized. The following officers were elected: R. P. Generaux, President; Richard T. Yates, 1st Vice President; Carl D. Pratt, 2nd Vice President; H. S. McQuaid, Secretary-Treasurer. The various committees will be appointed shortly and activities of the chapter will then begin.

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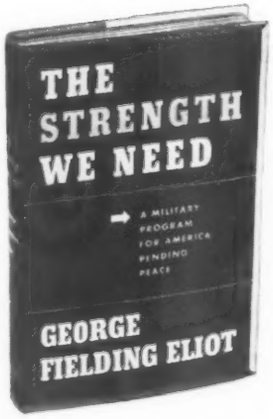

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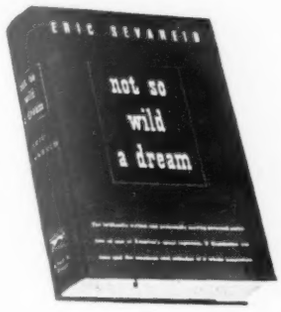

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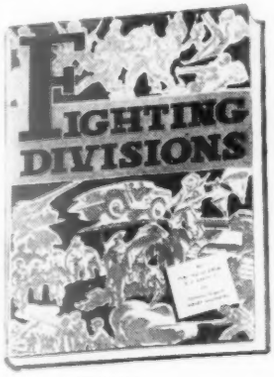

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The Chemical Warfare Association deeply appreciates the interest of the following life members:

Mr. Natale Boggio
Mr. Homer Dunn
Mr. George B. Dryden
Mr. Joe F. Etter
Mr. J. E. Jamison
Mr Ralph McGean
Mr. Louis M. Plansoen
2nd Lt. Robert S. Rabinowitz
Lt. Col. Frank A. Rohrs

Coordinating Committee

(Continued from page 56)

merits. Six of the other eight associations approved, providing that:

1—General Dwight D. Eisenhower would be the principal speaker.
2—The War Department would furnish all other Army officials selected by the committee to present a true picture of our Army, present and future.
3—The meeting be held away from Washington, D. C.
4—The Army speakers would talk in an "off the record" fashion and present vital facts concerning our Army.

The War Department gave assurance of full cooperation regarding the above and promised a program which the committee felt certain would attract key industrial, scientific and professional men from all parts of the United States.

The Chemical Warfare Association is deeply grateful to Col. Morrill and the Chicago Chapter for all of the time and effort they are contributing toward the success of this meeting. We are also highly appreciative of the personal contributions being made by Mr. George Dryden. Their generous assistance will definitely help in building a strong purposeful association, add character and integrity to its actiivties and in a small way further the development of a strong National Defense.

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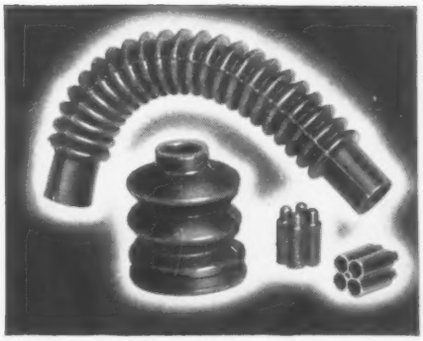

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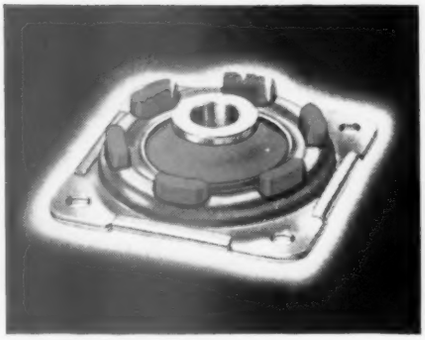

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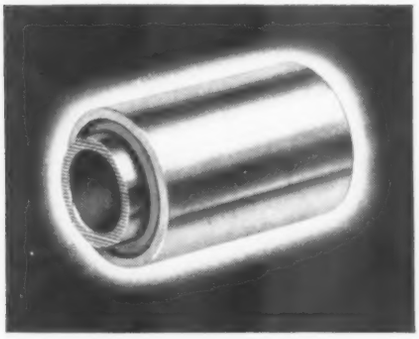
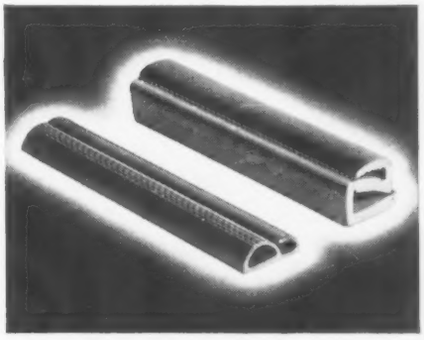
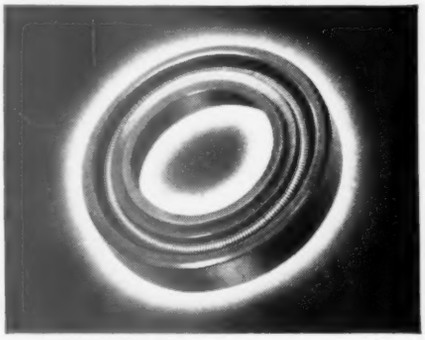


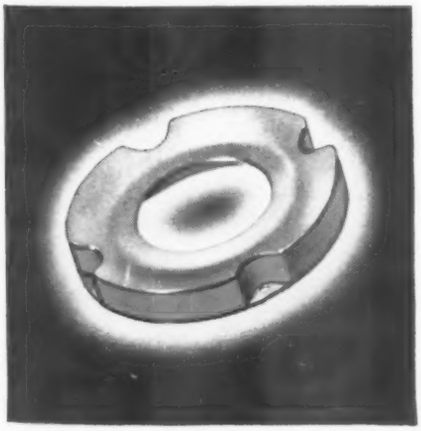
SILENTBLOC BEARINGS for oscillating equipment—need no lubrication, work silently, long lasting, unharmed by dust or liquid.



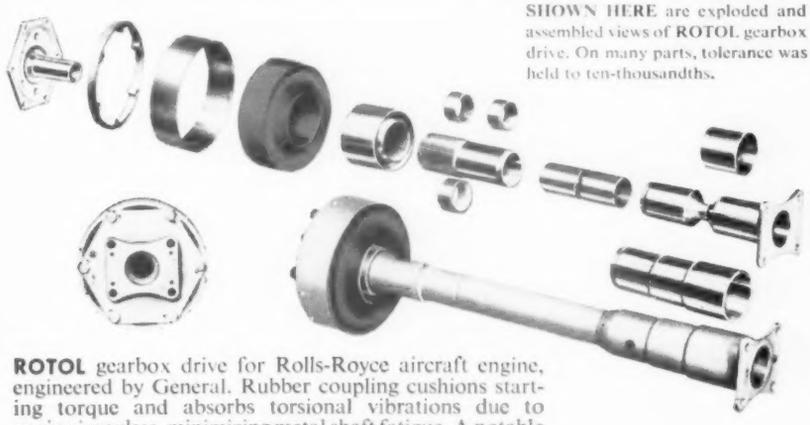
EXTRUDED RUBBER in any solid or hollow shape, made accurately to your specifications from any type of rubber.



OIL SEALS for lubricant and hydraulic applications, engineered to meet your needs in efficiency and long service.



RUBBER-bonded-to-metal parts of all kinds, made to specification. In ROTOL drive, shown at right, rubber is bonded to metal.



SHOWN HERE are exploded and assembled views of ROTOL gearbox drive. On many parts, tolerance was held to ten-thousandths.

ROTOL gearbox drive for Rolls-Royce aircraft engine, engineered by General. Rubber coupling cushions starting torque and absorbs torsional vibrations due to engine impulses, minimizing metal shaft fatigue. A notable example of General's skill in precision engineering.

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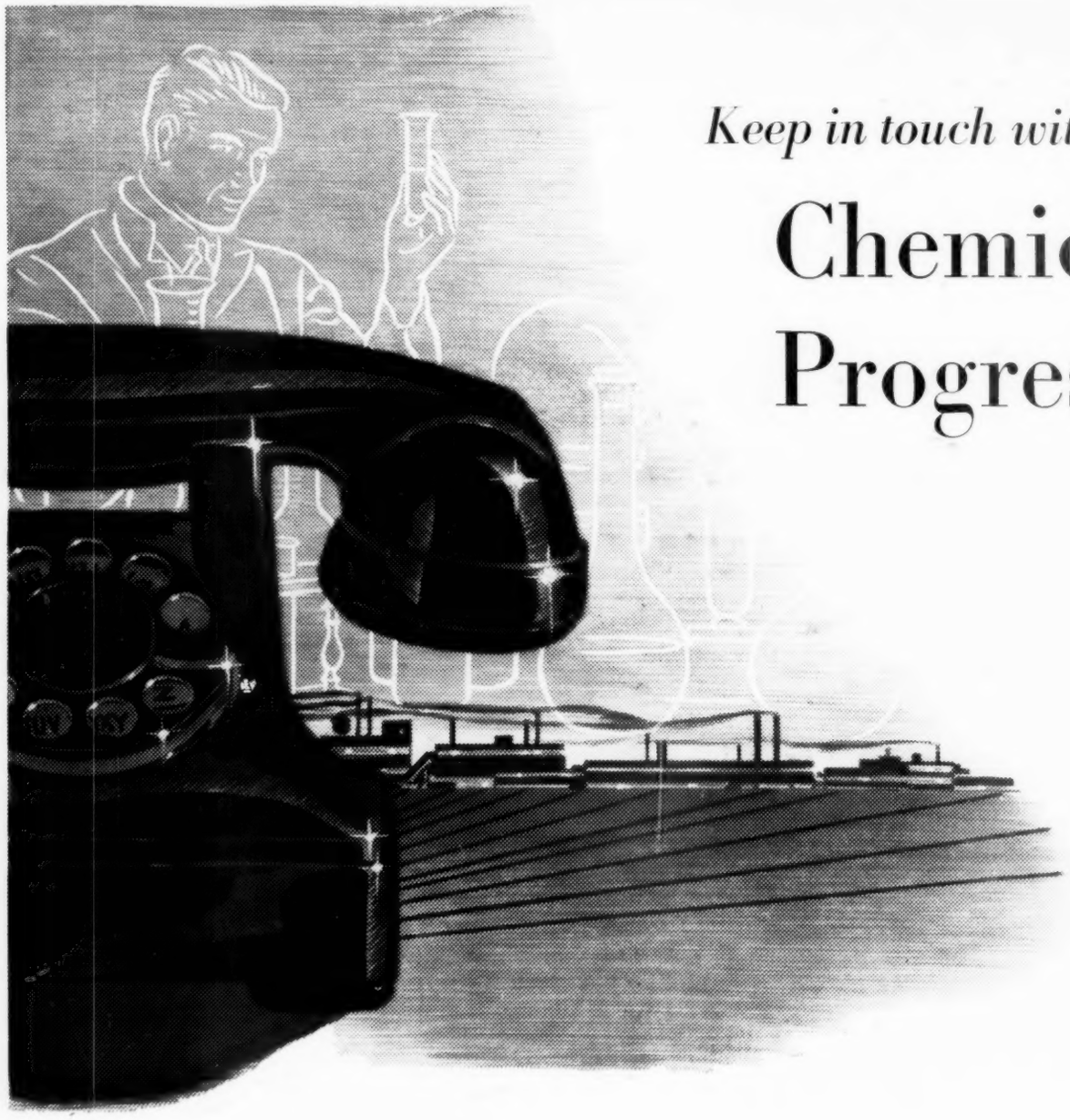

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